FORESTRY ABSTRACTS

VOLUME 21 1960 NUMBER 2

A SUMMARY OF INFORMATION ON *AUCOUMEA KLAINEANA*

By

R. W. BECKING

PART II

12. ARTIFICIAL REGENERATION

Artificial regeneration is becoming a necessity in tropical rain forests. It is accomplished by spot sowing or planting seedlings, striplings, etc., on completely cleared lines, strips or areas—techniques that should include the use of natural regeneration wherever possible.

(1) *Line sowing and planting*

This was the earliest technique applied to Okoumé (since about 1920 [35, 36]) and involved sowing of 3–8 seeds per spot, along with transplanting of young seedlings, in cleared lines 1–2 m. wide in the natural forest. The spots were spaced at 10 m. in lines 20–40 m. apart and oriented generally in an east-west direction to admit maximum light [75]. The 1- to 2-m.-wide cleared lines, however, closed very rapidly, the girdling and cutting of overstorey trees near the line did not always progress fast enough to prevent retardation of seedling height growth, and seedling replacements were called for repeatedly so as to avoid irregularities in the line plantation. This technique has now been largely abandoned because of its generally poor results, its high cost, and difficulties over labour [35, 37, 39, 84, 107].

(2) *Strip sowing and planting*

Experiments were started in 1929–30 to establish Okoumé regeneration by spot sowing or planting in 10- or 20-m.-wide cleared strips. Since 1936, 20- to 30-m.-wide strips have generally been adopted, alternating with 20-m.-wide uncleared strips of the natural forest. Experience shows that a 50% clearing of the forest by such alternating strips can bring success [35, 36, 39, 88]. The following improved technique has been applied since about 1950:

Towards the end of the dry period narrow lines are cleared in the forest, indicating the boundaries of the strips. Trees of $\geqslant 30$ cm. d.b.h. are girdled in the adjacent areas that are not to be cleared. In October the strips to be clear cut are felled in two operations, the first removing the understorey and trees < 20 cm. d.b.h., the second, all large saleable trees. The logging is crude and much timber is damaged in felling and skidding. After logging, the strips are cleared of slash and vegetation, which are dumped on the adjacent uncleared strips, and then weeded just before the Okoumé sheds its seeds (January–February). If there are sufficient seed-trees near by, natural regeneration may become established. However, it is the general practice to collect seeds from Okoumé trees near by and sow them in a central line on the strip, 4–5 seeds per spot, with 0·75–1·00 m. between spots. The seeds are covered to the tips of their wings with loose humus and soil by light harrowing. If the soil is moist the fresh seed will germinate within 1–2 weeks. Thereafter only careful weeding and release operations—particularly important during the first two rainy seasons—can ensure seedling survival and development. These must include the complete removal of small stools which will otherwise produce dense, low coppice growth of great vigour.

Comparative data of the labour (man-days/ha.) and the costs involved in the execution of the line and strip planting methods have been published [35, 36, 107, 123].

This improved strip-planting technique has, in fact, many drawbacks: (1) The uncleared strips are a constant source of weed invasion. (2) Trees on the uncleared strips quickly encroach with their crowns on the cleared strips. (3) In the first 2–3 years, it is essential to clean at least a 2- to 3-m.-wide strip of all vegetation round the central planting line. (4) The maximum enrichment amounts to only

40–50% of the whole forest area; during the planting period of 198 days available, almost 100% enrichment could be achieved by the line-planting method, although the over-all survival rate is lower. (5) Without repeated timely release the plantation will fail. The method, however, seems to be the only feasible one in Gabon under present conditions of lack of manpower and supervisory personnel. About 150–250 ha. are annually so regenerated, while another 800–1000 ha. previously regenerated are given annual maintenance treatment [14, 18, 20, 23, 28].

Silvicultural experience elsewhere in the tropics [43, 68, 74, 110, 123] confirms that partial clearing of natural forest involves generally costly and laborious weeding, plus release operations at frequent intervals, if the regeneration is to survive; it achieves, moreover, only a partial enrichment of the forest. More economical and effective clear-cutting methods need to be sought, along with improved methods of tree poisoning to supplant girdling, e.g. by growth regulators such as 2,4-D plus 2,4,5-T [59] or by Na arsenate tabs inserted under the bark [110, 133].

(3) *Clear cutting and planting*

Clear-cutting methods have so far been tried only on limited areas in Gabon and Spanish Guinea, but they appear to achieve more effective and economical weed control, in conjunction with the planting of well developed transplants or striplings rather than sowings. The technique so far worked out in Gabon is as follows: A nursery is established locally in December and Okoumé seeds are sown 10–15 cm. apart in rows 25 cm. apart. About March 15 the seedlings have developed their first leaves (usually 3); they are ready for transplanting to the clear-cut areas at the age of 1½–2 months. The balled seedlings, wrapped in a leaf of *Sarcophrynium oxycarpum* ("Okéku" in the Fang language), are transplanted to a small, freshly cleared strip on the clear-cut area, which will have produced an initial growth of grass and fast-growing herbs immediately after the first rains. During the first days after planting, the young plants are shielded from direct sun by branches stuck in the ground around them. Planting operations must be finished within 15 days because of the approaching dry period in June, April 15 being about the last possible date. Normally a survival of 65–95% of the plants can be expected. Replacing casualties is still feasible within the first year, but later replacements will generally get so retarded in height growth as to render them unfit to compete successfully, and their removal in the first thinnings is inevitable. Planting sufficiently close to avoid replacements is therefore recommended. Optimum planting density is given [35] as 1000 plants/ha. (spacing of 3 × 3 m.) or ca. 2500 plants/ha. (spacing of 2·5 × 1·5 m.). Subsequent weeding operations are restricted to the small strips where the transplants are actually planted, but they must be intensive.

No large-scale trials of the taungya (*sartage*) method have been attempted in Gabon or Spanish Guinea. The taungya system seems to be considered impracticable on a large scale because of the sparse population and the often insurmountable animistic concepts of the primitive tribes, but may be advantageously applied, as in other tropical lands, in the more developed and densely populated coastal regions.

The clear-cutting system appears to offer the best possibilities for Okoumé, particularly in view of the strong tendency towards full mechanization of the logging operations. The heavy tractors used for log skidding can be used advantageously in such clearing operations, which will also encourage the operators towards a more highly integrated use of all the timber present. Donis [68] recently reported that clear cutting in blocks had given the best results in forest conversion in the Belgian Congo. Recommended further [43] is the use of 10- to 12-months-old planting stock in the form of transplants or striplings. These have a more fully developed root system and are tall enough to start with a decided advantage over the competing vegetation. In addition, the raising of stock in local nurseries will result in a 15–20 times more efficient use of the collected seed and in far better seedling survival than was ever achieved by spot sowing in either the line or strip techniques in natural forest. The establishment of perennial ground-cover and nurse crops that suppress the invading native weed vegetation should constitute a further safeguard and help to avoid the establishment of a grass wilderness that creates a continuous fire hazard and often leads to the total loss of the Okoumé plantation. Recommended for trials are the following:

Nurse Crops		Ground-Cover Plants
Perennials	Annuals	Perennials
Leucaena glauca	*Calopogon mucunoides*	*Indigofera teysmannii*
Tephrosia candida	*Centrosema pubescens*	*Indigofera galegoides*
Tephrosia maxima	*Centrosema plumieri*	*Eupatorium pallescens*
		Lantana camara
		Tithonia diversifolia

Such intensified work may be expected to establish homogeneous and even-aged Okoumé stands of high-quality timber [20, 23, 28, 39, 40, 84, 110]. Little is known about silvicultural practices in Spanish Guinea.

13. RATE OF GROWTH, FORM AND VOLUME

Systematic growth studies of Okoumé stands have not yet been undertaken either in Gabon or in Spanish Guinea; only isolated observations have been published, often without adequate information on site quality or stand condition.

Diameter Growth

Franzini [77] reported annual d.b.h. increment differences during the initial development of thrifty Okoumé stands on two different sites, viz. 2·5 cm./year on loamy soils and 1·6 cm./year on sandy soils. Many authors [36, 39, 56, 77, 88, 107] have stressed the importance of release cuttings or thinnings for diameter growth. Results of thinning in a naturally regenerated stand after five years are reported as follows:

D.b.h. class	Mean annual d.b.h. increment of previous 5 years	
	unthinned stand	thinned stand
30–40 cm.	0·44 cm.	0·61 cm.
40–50	0·77	0·73
50–60	0·99	1·11
60–70	1·20	1·37

The mean annual d.b.h. growth of another stand, 5 years old, is reported as 1·0–1·7 cm. and 3-year-old seedlings measured 8–10 cm. [36, quoting Heitz].

Height Growth

Donis [68] has reported a mean annual height growth of 1·00 m. for a 14-year-old natural stand. Capdevielle [56] reports the mean annual height growth for a 6-year-old stand as varying from 0·65 to 2·50 m. with an average of 1·00 m. Heitz [88] stated that a height of 4–6 m. was reached in the first 3 years. The following table, with growth data from natural or planted Okoumé stands, gives fuller indications of the growth potential of the species:

			Dominant Trees		Mean Annual Increment	
Author	Age in years	Okoumé trees/ha.	Mean d.b.h. (cm.)	Mean height (m.)	d.b.h. (cm.)	height (m.)
Aubréville [35]	17*	790	29·0	30–32	1·7	1·75
	25*	833	24·5	30	1·0	1·00
Aubréville [39]	3·5	1040	9·1	8–10	2·6	2·29–2·86
	6	610	9·8	15	1·6	2·50
	6	420	8·9	13–16	1·5	2·17–2·67
	6	420	9·4	10–12	1·6	1·67–2·00
	6	780	9·6	16	1·6	2·67
	6	750	10·5	15	1·8	2·50
	6	750	9·8	14	1·6	2·33
	7	1600	11·3	16–17	1·6	2·29–2·43
Den Hulster [67]	5	1650	18	18	3·6	3·60
Hellinga [90]	9·5	825	25·5	17·9	2·6	1·88

* Believed to be natural stands; the rest are plantations.

No data on the form or volume of the Okoumé tree have been published. Scattered reports indicate that an Okoumé of 80 cm. d.b.h. has an average volume of 5 cu.m. [in 35].

It is estimated that in Gabon Okoumé averages 16% of the timber volume in natural forest, whereas in Spanish Guinea it is about 12% [35, 36, 55, 56]. In its optimum range, the mean volume/ha. can increase to 21%, and in the south, bordering on the savannas, it may run as high as 31%. The mean volume on a hectare in small, pure, natural Okoumé patches is 58·5 cu.m., the possible maximum under these conditions being about 333 cu.m. [35, 56].

14. MANAGEMENT AND YIELD REGULATION

Gabon is not richly endowed with natural resources other than forests, so that forestry will always remain one of its prime sources of income. Gabon and Spanish Guinea hold a monopoly in Okoumé production. The Gabon Forest Service was created in 1924 in order to halt the rapid depletion of the Okoumé resource, its major activities comprising fire control, management and law enforcement; its earliest action was to prohibit the use of fire in clearing operations near savannas undergoing reforestation. The first legislative measures, enacted in 1899, 1904 and 1907, were aimed at preventing further uncontrolled depletion of Okoumé and prohibiting the use of fire [71]. The Forest Service tries to regulate the primitive practices of shifting cultivation through protection of valuable forests against clearing or damage. Such tracts are proclaimed as forest reserves by legislative act. A long-range and intensive silvicultural programme is being executed to enrich depleted tracts by techniques of natural or artificial regeneration. The annual report of the Gabon Forest Service for 1956 indicates that 20,258 ha. have been enriched since 1936, by strip or line methods, of which 8533 ha. consists of dense Okoumé stands having a potential yield of 840,000 tons of timber. During the past 10 years, between 800 and 1100 ha. have been enriched annually. Enrichments in the classified forest reserves totalled 47,500 ha. by 1956, in which year silvicultural maintenance covered 1612 km. of strip plantings, and also 4643 ha. improved by release and thinnings. Supervision, law enforcement on logging operations and issue of logging permits have been delegated to the Forest Service. By the end of 1956 a total of 1,786,379 ha. had been leased under logging permits in Gabon [28]. In addition, the Forest Service determines the boundaries of the permit, helps the operator in his road (extraction) planning, landings, etc., and tries to improve floating conditions in the rivers. Many moves to improve transport and communication facilities are apparent from the post-war literature [47, 60, 61, 80, 106, 130, 137]. It is becoming increasingly important to establish such improvements, since logging operations must soon be transferred to the interior of Gabon [23, 28].

Three kinds of logging permit are issued: (*a*) the "Permis de Chantier", (*b*) the "Permis de Coupe", and (*c*) the "Concession" (Permis de Coupe industrielle) [71]. The first, issued exclusively to natives, leases blocks of 100 to 500 ha. for a period of 1 year but is renewable for another 5 years. The second, issued to both natives and French citizens, leases square blocks of ca. 2500 ha. against a security deposit of Fr. CFA 5000 for 1 year, with a maximum extension to 10 years. The "Concession" is open only to logging and plywood concerns under French control. This gives logging rights over 1 or 2 extensive tracts of rectangular shape, of 5000–30,000 ha. each, for a maximum period of 25 years, but may be renewable for a further 25-year period. On all three permits the Gabon Forest Service controls the method of felling, timber removal for road and camp construction, the preservation of marked seed-trees on the logged tract, and the number and quality of logs that may be exported. The final grading and the actual export of the logs, however, including the levy of duties and taxes, is handled by the Wood Bureau or O.B.A.E. (Office des Bois de l'Afrique Equatoriale Française), which is the sole timber-sales organization in Gabon (see also Export and Trade, p. 169).

The Forest Service is also responsible for the exploration and inventory of the interior forests. Aerial photography has been used in the preparation of forestry maps and for the location of pure Okoumé stands on these maps [83]. A total of 160,000 ha. was inventoried in 1956 in this interior zone, giving an estimated one million tons of merchantable Okoumé timber harvestable there within the next 10–15 years. At the same time legislative measures were passed (28th November 1956) authorizing the issue of logging permits for areas of 10,000–25,000 ha. [28].

Past legislation has not always promoted good management, and Grandclément [81] proposed a number of new measures, providing *inter alia* for observance by licencees of sustained-yield logging through a simple management plan regulating the annual cut, for compulsory harvesting of *all* commercial species above a minimum d.b.h., and tending operations to be carried out, after fellings, as directed by the Forest Service. To date, however, there is no indication that Grandclément's proposals have been accepted either in whole or in part, by the Gabon government.

Aubréville [36] developed an imaginative plan for the enrichment of the 2,000,000 ha. of production forests in Gabon. Under the strip method, he calculated that an average of some 156 Okoumé trees/ha. can be expected to grow to exploitable size, corresponding to 780 cu.m. Taking half of this as a more realistic figure would give 200 tons/ha. If a 50-year conversion (enrichment) period were to be adopted, this would mean an annual conversion of some 40,000 ha. with an estimated production of 8 million cu.m. Taking the costs and salaries of August 1948, Aubréville calculated that Okoumé would cost a minimum of Fr. CFA 350 per ton. With labour costing Fr. 11/day and strip cutting, together with the construction of camps, logging roads, and landings, consuming 90 man-days/ha., the direct costs of enrichment would amount to Fr. 1000/ha. Adding Fr. 600/ha. for personnel and supervision and 120 for materials, the total cost amounted to Fr. CFA 1720/ha., or 8·60/ton against the then trade value f.o.b. of 350/ton. The repeated tending operations on the Okoumé strips were assumed to amount to another Fr. 1500/ha. *in toto* or 7·50/ton. The general drawback to this gigantic plan is lack of capital and of labour and qualified supervisory personnel [108, 115].

15. CONVERSION AND EXTRACTION

Recent trends are towards increased mechanization [80, 121, 130], notably in felling, which was previously done laboriously and wastefully by the axe from platforms erected above the buttresses, but now almost entirely by one-man power saws. Trials with Homelite, McCulloch and Stihl saws in felling 165 Okoumé trees of 70–190 cm. d.b.h. indicate a felling time of 4 to 39 minutes [118, 121, 122]. Tuffier [137] reports the use of electric Atkins saws powered from D7 Caterpillars. In extraction to waterway, tractors and logging trucks are largely replacing the small-gauge railway [47, 103, 106, 114, 115, 130] and an extensive network of hauling roads is under development [130]. Floating of the light Okoumé logs still, however, constitutes the most important means of transport to the coast. They are rafted in loose sections of 47 × 9 m., 72 × 9 m., 93 × 9 m. or 93 × 12 m. by natives highly skilled in rafting work, and towed across the numerous lakes by tugs [61]. The journey takes several months and is necessarily seasonal.

16. DESCRIPTION OF THE WOOD

Okoumé is a light-weight, soft wood of homogeneous structure and light salmon-pink to dark pink coloration. The seasoned wood has no scent or taste. Growth rings are usually distinct because of variations in fibre density and coloration. Vessels are visible to the naked eye and are evenly distributed. There is little or no visual distinction between sapwood and heartwood.

The vessels are scattered, single or in radial groups of 2 to 3, rarely 4–7, with an average density of 6–10 vessels per sq. mm. Their dimensions are: tangential, 0·07 (minimum)—0·22 (average)—0·28 (maximum) μ; radial, 0·10—0·17—0·25 μ. Pits are present only in vessel walls bordering on parenchyma cells; they are quadragonal to hexagonal, 10 μ or more in diameter. In the heartwood the lumina of the larger vessels are often filled with tyloses and granular resinous deposits. The fibres are thick-walled (5–15 μ), and from 300 to 2200 μ long, average 900, and 13 to 35 μ wide, average 24 μ, the length/width ratio being 42. They are generally septate, with up to five thick partitions. Such parenchyma as occurs is chiefly paratracheal and occupies only 2·5% of the cross-sectional area [52]. The rays are heterogeneous and of type III, rarely of type II [101], with an average density of 10 rays per sq. mm. They are mostly biseriate, rarely 1 or 3 cells thick, and from 8 to 25 cells high, average 13; width 4–28 μ, height 12 to 600 μ, average 380. The ray cells are thin-walled, the upper and lower ones roughly triangular (35–75 μ high), the central ones more cubical or elliptical (12–18 μ high). Numerous minute oval or elongated half-bordered pits establish contact with bordering prosenchyma cells. In most ray and parenchyma cells a granular, yellowish to reddish brown resinous deposit coats the cell walls. As a rule no crystals are found in the parenchyma cells. [2, 4, 5, 12, 21, 27, 33, 50, 54, 66, 69, 70, 85, 86, 91, 93, 94, 95, 100, 116, 120, 128, 132, 141].

17. TIMBER PROPERTIES AND USES

(a) *Technological Properties*

Okoumé wood has a high SiO_2 content, amounting to ca. 1% on an oven-dry basis [120]. Its ash content is reported to be 0·5–0·6%, of which 25–61% is SiO_2 [4, 57, 116, 128]. This high SiO_2 content is apt to cause excessive heating and blunting of the saw in milling, calling for special tempered-stellite, swaged teeth and about twice the normal saw speed (21–27 m./sec., optimum 22·5) [12, 25, 64, 127]. In rotary peeling, dulling of the knife has also been experienced, and a tendency to pick-out (woolliness) if the knife is not razor-sharp [54, 99]. While peeling can be done fairly satisfactorily at ordinary temperatures, seasoned logs are customarily steamed for 72 hours at 65–70° C., particularly if thick veneer is wanted. Special knife and pressure-bar settings and special cutting speeds are recommended [124]. Veneer yields are generally high, e.g. a 69% over-all yield of graded veneer or 74% yield of green-clipped veneer inclusive of salvage, when based on the volume of 5-ft. billets [16]. The veneer dries flat, without splitting, cockle, stain or wet patches. The dried veneer is not markedly tough, but it requires no special care in handling either in the wet or dry state. Shrinkage in thickness from green to air-dry (8% moisture content) is 3·8% [16, 19, 79]. Okoumé glues readily with all types of adhesives, but durability tests of plywood adhesives in the tropics, under shelter and exposed to weathering, have proved phenol and resorcinol glues to be the most satisfactory for Okoumé [24, 58].

Veneer shelliness (i.e. splitting apart of the glued veneer) has been attributed generally to a faulty combination of knife settings and pressure-bar compression rather than to the bonding quality of the glue [96]. Okoumé veneer is of excellent quality, moderately fine in texture and of great uniformity in colour and grain. Among tropical woods Okoumé has an above-average cellulose yield and is well suited for making kraft papers [33, 98, 128].

(*b*) *Physical and Mechanical Properties*

Okoumé is similar in physical properties to *Liriodendron tulipifera*, *Populus tremula* and *P. tremuloides*, and in mechanical properties to *Betula verrucosa* and *B. papyrifera*. The following tables constitute a summary of the physical and mechanical properties from published information [2, 4, 5, 10, 12, 21, 27, 42, 52, 54, 79, 87, 91, 98, 99, 127, 128, 129, 132].

TABLE I

PHYSICAL PROPERTIES OF OKOUMÉ

	Metric Units			Anglo-American Units		
		kg./cu.m.			lb./cu.ft.	
Property	low	typical	high	low	typical	high
Green weight/volume ..	593	625	721	37	39	45
Air-dry wt./vol.	370	448	561	23	28	35
Oven-dry wt./vol. ..	340	400	500	21	25	31

% shrinkage from green to oven-dry dimensions—	low	typical	high
volumetric	9·5	11·3	12·6
tangential (T)	6·1	6·1	6·6
radial (R)	3·5	4·1	5·6
ratio T/R		1·08–1·61	
longitudinal	0·2	0·3	0·4

TABLE II

MECHANICAL PROPERTIES OF OKOUMÉ

	Metric Units			Anglo-American Units		
		kg./sq.cm.			lb./sq.in.	
Property	low	typical	high	low	typical	high
Static bending strength (air-dry condition)—						
Modulus of rupture ..	460	886	1120	6543	12,600	15,930
Stress at proportional limit	343	479	615	4878	6813	8747
Modulus of elasticity ..	80,000	80,502	84,000	1,138,000	1,145,000	1,195,000
Maximum compression ‖ ..	186	376	480	2645	5348	6827
Tensile strength ⊥	15	18	21	216	256	302
Shear ‖		69			980	
End hardness	256	284	340	565	626	750
Side hardness	90	110	200	198	243	441
Holding power for No. 10 screws—		kg.			lb.	
End grain..	205	234	300	452	516	662
Side grain..	298	346	383	658	762	844

Cleavage is reported as 33–58–75 lb./in. of width (5·9–10·3–13·4 kg./cm. of width) [127] or as 2·27 kg./sq.cm. (32 lb./sq.in.) [98, 128].

(*c*) *Wood Uses*

Okoumé is used in its solid form for cigar boxes [27, 52, 98], packing cases, light trunks, interior frame constructions, bodies of railway coaches and automobiles [2, 4, 5, 12, 21, 27, 54, 91, 94, 101, 113, 120, 126, 127, 128, 132]. Its use in laminated or plywood form, however, is far more important, and it is in great demand for panelling, interior woodwork, door constructions and partitions. It can be readily stained to imitate Mahogany [27, 126]. In the form of thin two-ply planking it was used during World War II for small landing boats and rescue craft [21, 132]. It is also used in the interior trim of passenger planes, for the transverse webbing of wings or ribs of planes, and in the form of laminar-flow aerofoils [53].

(*d*) *Durability*

Okoumé wood is susceptible to termite attack. Even when treated with creosote, DDT, PCP or BHC, by methods designed to give deep radial penetration of the preservative, it is still attacked, indicating that the preservatives are not satisfactorily absorbed. Generally, Okoumé is of only moderate durability and decays readily when exposed without any protective coating [15, 58]. Okoumé logs stored in salt or brackish water are readily attacked by marine borers (*Teredo* spp.) and also a "soft-rot" fungus (*Helicoma maritimum*) [15]. However, logs can be stored for 12 months in fresh water without detriment to quality [45].

18. EXPORT AND TRADE

The timber trade from Gabon dates back to 1855 [71], and Okoumé was probably an item of trade from 1850. The first official account of Okoumé imports into Europe, however, appeared much later—in 1885—on the occasion of the First International Exhibition at Antwerp, Belgium [102], but from the scanty description given of the imported "Acoumé" wood, it must actually have been a species of the closely related *Canarium* or *Pachylobus*. It was Chavannes, the Governor of Gabon, who gave the great impetus to trade in the genuine Okoumé, when, in 1890–91, he succeeded in interesting the German wood industry [71]. Official records of Okoumé exports from Gabon exist back to 1883, and its regular export started from 1896–97. In 1896 the total export of tropical timber from Gabon amounted to 3679 tons, most of this being Okoumé logs. Export statistics [8, 54, 109, 119] indicate that just before World War I (1910–14) 80,000 to 130,000 tons of Okoumé were exported annually. In the decade 1920–30, the annual figure rose to 200,000–300,000 tons, and in 1930–40 to 350,000–400,000 tons, reaching an all-time high of ca. 450,000 tons in 1950–55 [12, 26, 54, 65, 92, 109, 111, 119, 125, 128]. By comparison, exports from Spanish Guinea averaged only 31,000–32,000 tons annually in 1953–57 [56, 119]. Fournois [73] reports that in 1955–57 the total amount of Okoumé harvested in Gabon varied between 550,000 to 600,000 tons annually, a drain that cannot be indefinitely sustained under existing conditions of management and silvicultural practices. It has been calculated [17, 29] that, during the period 1946–55, Okoumé log production constituted about 12% of the entire log production of Africa, or some 6% of the entire log production of the world, and Okoumé log export to about 20–25% of the total timber export of Africa, or some 6–8% of the total world export.

The principal consumers of Okoumé logs are France, Germany, Netherlands, Israel, England and the Scandinavian countries, though exports reach about 15 countries annually; Czechoslovakia was added to these in 1954. Since 1950, England and Germany have decreased their Okoumé imports in favour of other light-weight tropical woods available on the international market at a much lower price [21, 22, 26, 98, 128]. Since 1951, 4–6 modern plywood mills have started producing veneer and plywood in Gabon itself, with numerous sawmills consuming the low-grade material [7, 41,105]. This development must eventually reduce Okoumé log exports to Europe. Locally produced Okoumé plywood amounted in 1956–57 to about 15% of the total African plywood production, but only to about 0·3% of total world production [17].

The French authorities exercise a tight control on Okoumé export and production by giving the monopoly in timber trade to the Wood Bureau (OBAE), a governmental organization that not only grades the logs but determines sale prices and imposes export and other duties. In 1956 the average price of Okoumé logs on the Gabon coast was Fr. CFA 4000 to 5000/ton, which taxes, duties, and freight raised to Fr. 14,000–17,000/ton landed in Europe. Considering its light weight, Okoumé has been severely burdened by excessive duties and freight, reducing substantially its competitive position in price and value [6, 62, 63]. Capdevielle [56] proposed—but without effect—the creation of a central timber agency similar to the OBAE, having monopolistic powers of regulating both the export and production of timber.

19. INTRODUCTION TO OTHER TROPICAL COUNTRIES

Elsewhere in Africa. Okoumé has been successfully introduced in the Cameroons [30, 48, 94] and recently in the Belgian Congo at Gimbi [68], i.e. in regions whose climate closely resembles the lowland rain climate of Gabon.

S. America and Caribbean. While the coastal plains from Venezuela to northern Brazil and also the Guianas should be suitable for Okoumé, it does not appear to have been tried except in Surinam. Here it was introduced in 1950 in two localities [67], seed received in February being sown immediately and giving nearly 100% germination. Two plantations at 1·5 × 3 m. spacing were established, one in the young and the other in the older coastal plain. Development was better in the former, a height of 18 m. and a d.b.h. of 18·5 cm. being reached in 5 years. In the latter, slower growth was accompanied by heavy branching over the whole length of the stem.

Indonesia. This offers the only other record of Okoumé introduction, in Java. The tree was first introduced in the Botanical Gardens at Bogor in 1934 and five years later a trial plantation was established at Tjikampek, in W. Java [3, 32, 89]. The seeds were germinated under shelter, transplanted into bamboo pots in the nursery within a week, and at 6 months 210 seedlings, then 20–30 cm. high were put out (20.11.39) at 4 × 3 m. spacing, under an initial light cover of *Leucaena glauca.* Some 10 of the transplants died in 1940 from drought. Thereafter no records were kept till the plantation was measured in 1948, when the 9½-year-old trees averaged 17·9 m. in height and 25·5 cm. d.b.h. Abundant flowering was noted. Many trees had developed crooked stems, forks and heavy branching which were attributed to wind damage [90]. The next year, unfortunately, saw the whole plantation, some 5 trees, illegally felled [131].

Other regions considered suitable for Okoumé introduction in S.E. Asia include the southernmost part of the Malabar coast in India, the west coastal plains of Ceylon, the southern coastal plains around Saigon and Djiring in Cambodia, the lowlands of the Malayan Peninsula, Sumatra (Atjeh, Palembang, Lambang), Borneo or Kalimantan (Bandjarmasin, Samarinda), Celebes or Sulawesi (Makasar, Bone), and the north coast of New Guinea or Irian Barat (Hollandia, Rabaul). Tropical Queensland is considered to have too low a rainfall.

REFERENCES

[1] ANON. (1904). *Aucoumea klaineana* Pierre. *Index Kewensis*, Clarendon Press, Oxford. Suppl. no. II.
[2] ,, (1928). L'Okoumé (*Aucoumea klaineana* Pierre). Association Colonies-Sciences, Paris.
[3] ,, (1939). Rapport (Voorlopig) van het Bosbouwproefstation, Buitenzorg [Bogor], Indonesia. De proeftuinen voor boomgewassen op Java. Bosbouwproefstation, Bogor.
[4] ,, (1941). *Holz Roh- u. Werkstoff* 4 (303–4). [*F.A.* 4 p. 105].
[5] ,, (1942). *Timb. Leafl. Timb. Developm. Ass., Lond.* No. 14.
[6] ,, (1946). *Foreign Commerce Weekly, Washington, D.C.* 27 April, 1946. [*F.A.* 8 p. 188.]
[7] ,, (1947). *Sth. Lumbern.* 1 Feb., 1947. [*F.A.* 9 p. 260.]
[8] ,, (1949). Annuaire statistique de l'Union Française Outre-Mer 1939–46. Chapitre F—Agriculture, élévage, forêts. Service des Statistiques, Ministère de la France d'Outre-Mer, Paris. [*F.A.* 13 No. 1760.]
[9] ,, (1949). *Bois For. Trop.* No. 9 (97–100). [*F.A.* 11 No. 220.]
[10] ,, (1950). Wood specimens. Annotated by H. A. Cox. Nema Press, London. [*F.A.* 11 No. 1825.]
[11] ,, (1951). African tropical timber. Organisation for European Economic Cooperation, Paris. [*F.A.* 13 No. 2386.]
[12] ,, (1951). *Bois For. Trop.* No. 18/19, 1951 (147–50). [*F.A.* 13 No. 2393.]
[13] ,, (1952). The Empire Forestry Handbook. Empire Forestry Association, London. [*F.A.* 14 No. 5.]
[14] ,, (1953). *Bois For. Trop.* No. 28 (45–6).
[15] ,, (1953). *Rep. For. Prod. Res. Bd., Lond. 1952* (33). [*F.A.* 15 No. 844.]
[16] ,, (1953). Trials of timber for plywood manufacture. Progress Report 19. Gaboon. *Aucoumea klaineana* Pierre. Forest Products Research Laboratory, Princes Risborough. [*F.A.* 15 No. 1873.]
[17] ,, (1953). Tropical timber: production and consumption. Organisation for European Economic Cooperation, Paris. [*F.A.* 15 No. 586.]
[18] ,, (1954). *Bois. For. Trop.* No. 33 (68–9).
[19] ,, (1955). *Rep. For. Prod. Res. Bd., Lond. 1954* (20–2). [*F.A.* 17 No. 878.]
[20] ,, (1955). *Bois For. Trop.* No. 44 (68–9).
[21] ,, (1955). Survey of African woods. A review of literature on the distribution, properties and uses of African woods. Yale University School of Forestry, New Haven, Conn.
[22] ,, (1956). *Bois For. Trop.* No. 48 (39–49). [*F.A.* 18 No. 822.]
[23] ,, (1956). *Bois For. Trop.* No. 50 (68–70).
[24] ,, (1956). *Rep. For. Prod. Res. Bd., Lond. 1955* (18). [*F.A.* 18 No. 964.]
[25] ,, (1956). *Bois For. Trop.* No. 48 (69).
[26] ,, (1957). *Marchés Tropicaux du Monde, Paris* 13 (600), (1162).
[27] ,, (1957). Okoumé. Houtinstituut T.N.O., Delft. [*F.A.* 19 No. 3365.]
[28] ,, (1957). *Bois For. Trop.* No. 56 (62–4).
[29] ,, (1957). World forest products statistics 1946–55. FAO, Rome. [*F.A.* 19 No. 4695.]
[30] ALBA, M. (1953). *Bois For. Trop.* No. 32 (11–4).
[31] ALLOUARD, P. (1949). *Bois For. Trop.* No. 10 (147–67). [*F.A.* 11 No. 1139.]
[32] ARDIKOESOEMA, R. I., and DILMY, A. (1956). *Rimba Indonesia* 5 (266–328). [*F.A.* 18 No. 2715.]
[33] ARIBERT, *et al.* (1947). *Rev. int. Bois* 14 (115), (3–7). [*F.A.* 9 No. 400.]

[34] Aubréville, A. (1947). *Bois For. Trop.* 2 (24–49). [*F.A.* 9 No. 1481.]

[35] ,, (1948). *Bull. Sci. Minist. Outre-Mer, Sect. Agric. Trop.* No. 2 (53–80).

[36] ,, (1948). Richesses et misères des fortês de l'Afrique noire française. Mission forestière: A.E.F.—Caméroun—A.O.F. 1945–6. Paris. [*F.A.* 10 No. 871.]

[37] ,, (1951). *Proc. UNSCCUR, Lake Success* 5 (114–6). [*F.A.* 14 No. 1091.]

[38] ,, (1953). *Bois For. Trop.* No. 29 (3–9). [*F.A.* 15 No. 1338.]

[39] ,, (1954). *Bois For. Trop.* No. 35 (5–9). [*F.A.* 15 No. 3550.]

[40] ,, (1954). *Bois For. Trop.* No. 33 (3–13).

[41] ,, (1956). *Marchés Coloniaux du Monde, Paris,* 12 (542), (969–71, 973–5).

[42] Banks, C. H. (1954). *J. S. Afr. For. Ass.* No. 24 (44–65). [*F.A.* 16 No. 907.]

[43] Becking, R. W. (1951). Okoumé (*Aucoumea klaineana* Pierre) Unpublished thesis, Landbouwhogeschool, Wageningen.

[44] Bellouard, P. (1955). *Bois For. Trop.* No. 39 (9–23). [*F.A.* 16 No. 3622.]

[45] Benoit, J. (1953). *Bois For. Trop.* No. 31 (42–9). [*F.A.* 15 No. 2015.]

[46] Bergeroo-Campagne, B. (1958). *Bois For. Trop.* Nos. 58 & 59 (17–32; 19–35). [*F.A.* 19 No. 4165.]

[47] Berthon, P. (1952). *Bois For. Trop.* Nos. 24 & 25 (260–8; 337–43). [*F.A.* 14 No. 1474.]

[48] Bernard, F. (1951). Personal communication: Quelques notes sur l'Okoumé. Libreville/Brazzaville A.E.F.

[49] ,, (1952). *Proc. 1st Conf. For. Interafric., Abidjan 1951* (353–8). [*F.A.* 16 No. 339.]

[50] Bertin, A., *et al.* (1927–1928). *Actes et Comptes Rendues de l'Association Colonies-Sciences, Paris* 3 (30), (243–61); 4 (31), (13–21).

[51] Bogshaw, W. M. C. (1958). Personal communication. Georgetown, British Guiana.

[52] Brehmer, W. von. (1928). Hölzer. 6. Okoumé-Holz. *In* J. von Wiesner: *Die Rohstoffe des Pflanzenreiches.* Bd. II. W. Engelmann, Leipzig.

[53] Brown, T. A. (1953). *Wood* 18 (466–7). [*F.A.* 15 No. 1905.]

[54] Brush, W. D. (1944). Foreign woods: Okoumé (*Aucoumea klaineana*). Forest Service, U.S. Department of Agriculture, Washington.

[55] Capdevielle San Martin, J. M. (1947). El bosque de la Guinea. Exploracion y explotacion. Dossat, Madrid.

[56] ,, (1949). Tres estudios y un ensayo sobre temas forestales de la Guinea continental española. Consejo Superior de Investigaciones Cientifícas, Instituto de Estudios Africanos, Madrid. [*F.A.* 13 No. 1986].

[57] C.C. (1926). *Agronomie coloniale, Paris* 15 (104), (74).

[58] Carruthers, J. F. S., and Hudson, R. W. (1955). *Wood* 20 (424–6). [*F.A.* 17 No. 2037.]

[59] Cebron, P. (1957). *Bois For. Trop.* No. 52 (9–15). [*F.A.* 18 No. 4069.]

[60] Cermak, F. (1948). *Bois For. Trop.* No. 5 (27–36). [*F.A.* 10 No. 327.]

[61] ,, (1949). *Bois For. Trop.* No. 9 (39–48). [*F.A.* 11 No. 399.]

[62] Cermak, F., and Zenaty, J. G. (1951). *Bois For. Trop.* No. 20 (209–26). [*F.A.* 14 No. 1692.]

[63] ,, ,, ,, (1952). *Wood* 17 (221–3; 262–5; 304–6; 342–3). [*F.A.* 14 No. 1693.]

[64] Chardin, A. (1956). *Bois For. Trop.* No. 50 (49–56). [*F.A.* 18 No. 2131.]

[65] Chevalier, A. (1917). Les végétaux utiles de l'Afrique tropicale française. Fasc. IX: La forêt et les bois du Gabon. Challamel, Paris.

[66] Collardet, J. (1929). *Trop. Woods* No. 17 (1–5).

[67] den Hulster, J. H. (1957). Personal communication: Introduction of the Okoumé in Surinam. Dienst 's Landsbosbeheer, Paramaribo.

[68] Donis, C. (1956). *Bull agric. Congo belge* 47 (261–320). [*F.A.* 17 No. 3776.]

[69] Engler, A. (1913). *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie, Leipzig* 48 (443–90).

[70] Engler, A., and Prantl, K. (1931). Die natürlichen Pflanzenfamilien. 2nd ed. W. Engelmann, Leipzig.

[71] Fabre, A. (1927). Le commerce et l'exploitation des bois du Gabon. Sté. d'Editions Géographiques, Maritimes et Coloniales, Paris.

[72] Foggie, A.; Kinloch, D.; Taylor, C. J. (1952). The development and problems of forest management and the progress of silvicultural research in the closed forest zone of the Gold Coast. Government Printing Department, Accra. [*F.A.* 14 No. 1788].

[73] Fournols, J. (1958). *Bois For. Trop.* No. 58 (64–71). [*F.A.* 19 No. 4693.]

[74] Foury, P. (1951). *Comptes rendus, Première Conférence Internationale des Africanistes de l'Ouest, Paris* Vol. 2 (3–10). [*F.A.* 13 No. 2867.]

[75] ,, (1956). *Bois For. Trop.* No. 47 (15–25). [*F.A.* 17 No. 3927.]

[76] Franzini, F. (1949). *Bull. agric. Congo belge* 40 (2355–66). [*F.A.* 11 No. 2501.]

[77] ,, (1956). *Bois For. Trop.* No. 50 (3–7). [*F.A.* 18 No. 1573.]

[78] Fuster Riera, P. (1947). Primera contribución al conocimiento del las maderas de la Guinea continental española. Instituto de Estudios Africanos y de la Dirección General de Marruecos y Colonias, Madrid. [*F.A.* 10 No. 2597.]

[79] Gaber, E., and Christians, G. (1929). Vergleichende Untersuchungen an Vollholz und Sperrholz aus Okoumé. *Heft Sperrholz, Suppl.* to *Zeitschrift für Maschinenbau, Berlin.* [As cited in No. 98.]

[80] Gazonnaud, P. (1949). *Emp. For. Rev.* 28 (350–5). [*F.A.* 11 No. 2864.]

[81] Grandclément, G. (1947). *Bois For. Trop.* No. 3 (24–30). [*F.A.* 9 No. 2618.]

[82] Cancelled.

[83] Groulez, J. (1954). *Bois For. Trop.* No. 35 (25–32). [*F.A.* 15 No. 3937.]

[84] Guigonis, G. (1950). *Proc. World For. Congr.* No. 3 (26–37). [*F.A.* 12 No. 2869.]

[85] Guillaumin, A. (1908). *Bull. Soc. Bot. France* 55 (261–9).

[86] ,, (1910). Recherches sur la structure et le développement des Burseracées. Applications à la systématique. Thesis, [Sorbonne University?] Paris.

[87] Harrar, E. (1941–1942). *Trop. Woods* 68 (1–11); 70 (1–15); 71 (26–32). [*F.A.* 3 p. 310; 4 pp. 108, 170.]

[88] Heitz, H. (1943). La forêt du Gabon. Larose, Paris. [*F.A.* 8 No. 1787.]

[89] Hellinga, G. (1950). *Rapp. Bosbouwproefsta., Buitenzorg* No. 27. [*F.A.* 12 No. 242.]

[90] ,, (1950). *Meded. Bosbouwproefsta., Bogor* No. 31; *Tectona* 40 (179–229). [*F.A.* 12 No. 2836.]

[91] Howard, A. L. (1948). A manual of the timbers of the world. Macmillan and Co., Ltd., London. [*F.A.* 10 No. 1835.]

[92] Howe, R. W. (1954). *Timb. Tr. J.* 211 (4085), (83–7). [*F.A.* 16 No. 2090.]

[93] Jane, F. W. (1953). *Timber News* 61 (157–9). [*F.A.* 16 No. 2138.]

[94] Jentsch, F., and Appel, E. (1936). *Z. Weltforstwirt.* 3 (110–20, 235–46).

[95] Johnston, D. R. (1953). *Wood* 18 (105). [*F.A.* 14 No. 3684.]

[96] Knight, R. A. G., and Newall, R. J. (1956). *Comp. Wood* 3 (5/6), (100–4). [*F.A.* 18 No. 3385.]

[97] Koehler, A. (1922). *Bull. U.S. Dep. Agric.* No. 1050.

[98] Kollman, F. (1951). Technologie des Holzes und der Holzwerkstoffe. I. Band. Springer Verlag, Berlin [*F.A.* 13 No. 2385.]

[99] ,, (1954). *Holz Roh- u. Werkstoff* 12 (465–71). [*F.A.* 16 No. 3461.]

[100] Koloc (1951). Werkstoff-Kartei Koloc. Fachbuchverlag G.m.b.H., Leipzig. [*F.A.* 16 No. 827.]

[101] Kribs, D. A. (1950). Commercial foreign woods on the American market. Edwards Brothers, Inc., Ann Arbor, Mich. [*F.A.* 14 No. 1482.]

[102] Lanessau, de (1885). Notes Exposition Universelle d'Anvers de 1885. [As cited in No. 65.]

[103] Lasserre, G. (1955). *Cahiers d'Outre-Mer, Paris* 8 (30), (119–60).

[104] Lavauden, L. (1941). *Rev. int. Bot. appl. Agric. trop.* 21 (606–11).

[105] Le Cacheux, P. (1947). *Bois For. Trop.* No. 2 (67–76).

[106] Lefébure, J. (1949). *Bois For. Trop.* No. 11 (315–25). [*F.A.* 11 No. 2883.]

[107] Le Ray, J. (1947). *Bois For. Trop.* No. 4 (31–40). [*F.A.* 10 No. 191.]

[108] Leschner, F. (1944). *Z. Weltforstwirt.* 10 (560–2). [*F.A.* 6 p. 272.]

[109] ,, (1950). *Weltholzwirtschaft* 2 (173–5).

[110] Letourneux, C. (1956). *Bois For. Trop.* No. 46 (3–10). [*F.A.* 17 No. 3949.]

[111] Marcon, Y. (1957). Personal communication. Centre Technique Forestier Tropical, Nogent-sur-Marne.

[112] Maudoux, E. (1954). *Bull. agric. Congo belge* 45 (403–21). [*F.A.* 15 No. 3423.]

[113] Mell, C. D. (1933). *Veneers, Indianapolis* July (8–9).

[114] Meniaud, J. (1948). *Bois For. Trop.* No. 6 (175–83). [*F.A.* 10 No. 1372.]

[115] ,, (1950). *Bois For. Trop.* No. 13 (1–3). [*F.A.* 12 No. 864.]

[116] Metcalfe, C. R., and Chalk, L. (1950). Anatomy of the Dicotyledons: leaves, stem and wood, in relation to taxonomy, with notes on economic uses. Clarendon Press, Oxford. [*F.A.* 12 No. 354.]

[117] Moreau, C., Moreau, M., and Jacquiot, C. (1948). *Revue de Mycologie, Paris, Supplément Colonial* [*F.A.* 12 No. 720.]

[118] Muizon, P. de, and Le Ray, J. (1957). *Bois For. Trop.* No. 51 (59–78). [*F.A.* 18 No. 2909.]

[119] Najero y Angulo, F. (1958). *Africa, Madrid* 197 (220–4).

[120] Normand, D. (1946). *Rev. Bois Appl.* 1 (6), (16–8). [*F.A.* 8 No. 1802.]

[121] Noyon, H. (1947). *Bois For. Trop.* No. 3 (35–8). [*F.A.* 9 No. 2304.]

[122] Okretic, B. (1947). *Bois For. Trop.* No. 2 (54–8). [*F.A.* 9 No. 1638.]

[123] Parry, M. S. (1956). *FAO For. Developm. Pap.* No. 8. [*F.A.* 19 No. 1590.]

[124] Pouzeau, P., and Pradal, H. (1957). *Bois For. Trop.* No. 54 (41–50). [*F.A.* 19 No. 1027.]

[125] Pouzin, A. (1930) *Rev. int. Prod. colon.* 5 (381–5).

[126] Record, S. J. (1926). *Veneers, Indianapolis* Jan., (22–4).

[127] Sallenave, P. (1955). *Publ. Centre Tech. For. Trop.* No. 8. [*F.A.* 17 No. 3211.]

[128] Schmidt, E. (1949). *Suppl. to Weltholzw.* 1 (12). [*F.A.* 11 No. 2730.]

[129] Scott, M. H. (1949). *J. S. Afr. For. Ass.* No. 17 (75–112). [*F.A.* 11 No. 335.]

[130] Simon, M. (1953). *Bois For. Trop.* No. 31 (15–26). [*F.A.* 15 No. 1396.]

[131] Soemarjo Joeswopranjoto. (1957). Personal communication: *Aucoumea klaineana.* Forest Research Institute, Bogor.

[132] Spalt, H. A., and Stern, W. L. (1956). *Trop. Woods* Nos. 105 & 106 (13–38; 65–97). [*F.A.* 18 Nos. 2049, 4499.]

[133] Swain, L. C. (1954). *Sta. Bull. N.H. Agric. Exp. Sta.* No. 408. [*F.A.* 16 No. 4087.]

[134] Taylor, C. J. (1954). *Emp. For. Rev.* 33 (150–7). [*F.A.* 15 No. 3413.]

[135] ,, (1954). *Bois For. Trop.* No. 37 (19–26). [*F.A.* 16 No. 1589.]

[136] Trial, G. (1938). *Nature, Paris,* 3035 (230–4).

[137] Tuffier, M. (1956). *Bois For. Trop.* No. 46 (17–28). [*F.A.* 17 No. 4003.]

[138] Unwin, A. H. (1920). West African forests and forestry. T. Fisher Unwin, Ltd., London.

[139] Waag, H., and Duplaquet, L. (1936). *Rev. int. Bot. appl. Agric. trop.* 16 (184), (982–90).

[140] Walker, A. (1958). Personal communication. Libreville, A.E.F.

[141] Webber, I. E. (1941). *Lilloa* 6 (441–65). [*F.A.* 4 p. 31.]

CORRIGENDUM

F.A. 21 (1): p. 6, line 10, *for* 82 *read* 9.

(*The previous part of the above article appeared in* F.A. 21 (1). *Reprints of the whole article are available from* Central Sales Branch, Commonwealth Agricultural Bureaux, Farnham Royal, Bucks, England, at 4*s.* each, post free.)

ABSTRACT SECTION

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

Translations

See also Nos. 1719, 2381, 2399, 2545.

1307. **Foreign-language translations of forest products research results.** U.S. Forest Products Laboratory, Madison. 1959. pp. 25. Limited distribution.

Lists 377 items. The translations are not published and are not available for free distribution, though they are available for reference at the Madison Branch of the U.S.D.A. library. Microfilms or photoprints of them may, however, be purchased from the Library, U.S. Department of Agriculture, Washington 25, D.C.

0 (038). Dictionaries

See No. 2261.

0 (047.1). Progress Reports

1308. **Annual Report, Forest Research—Glendon Hall, Faculty of Forestry, University of Toronto, July 1, 1958 to June 30, 1959.** University of Toronto, Toronto, Ont.

The report gives an account of investigations in progress. Citation in *F.A.*: *Rep. For. Res. Glendon Hall Fac. For. Univ. Toronto.*

0 (048.1). Bibliographical Lists

See also Nos. 1307, 1802, 1908, 2152–3, 2277, 2606–8.

1309. MALMSTRÖM, H., and MALMSTRÖM, C. Om den svenska skogslitteraturen före år 1900, hur den förekommer och hur den bibliografiskt förtecknats. **[Swedish forestry literature before 1900, and its bibliography.]** *Svenska SkogsvFören. Tidskr.* 57 (3), 1959 (437–52). Many refs. [Sw.]

Lists the chief works devoted to or touching on forestry, and the chief sources, e.g. law, agricultural and mining periodicals and royal commission reports.

0 - - 011. Terminology. Nomenclature.

See Nos. 1326, 1331, 1464, 2261, 2519.

0 - - 015. Mathematical and Statistical Methods

See also Nos. 1785, 2044.

1310. MATÉRN, B. Några tillämpningar av teorin för geometriska sannolikheter. **[Some applications of the theory of geometric probabilities.]** *Svenska SkogsvFören. Tidskr.* 57 (3), 1959 (453–8). 24 refs. [Sw.e.]

Briefly discusses the application of the theory to line surveys for estimating (*a*) lengths (e.g. of road networks or fibres), (*b*) size distribution of areas (e.g. of clear fellings); to point sampling of basal areas (angle counts); and to "distance methods" for estimating stem numbers [cf. *F.A.* 21 No. 809; 19 No. 4626]. *From author's summary.*

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

111. The Atmosphere. Meteorology. Climate and Microclimate

111.1. Composition, Structure, Mechanics and Thermodynamics of the Atmosphere in General

1311. LAKHANPAL, R. N., and NAIR, P. K. K. **Survey of the atmospheric pollen at Lucknow.** *J. sci. industr. Res. India* 17*C* (5), 1958 (80–7). 5 refs. P.O.

The most abundant pollen was that of *Holoptelea* (42·55%), followed by *Ailanthus* (22·30%), *Morus* (6·15%), and *Azadirachta* (4·16%). Almost all the types of pollen were from plants growing locally but some (e.g. *Alnus*) must have come from the Himalayas.

111.2. Radiation and Temperature

See also No. 1324.

1312. LAUROW, Z. Termistorowe mierniki temperatur i ich zastosowanie. **[Thermistors and their use.]** *Sylwan* 103 (8), 1959 (41–51). 14 refs. [Pol. russ.e.]

Describes the design of the thermistors, mentioning possible uses in meteorology, soil science, ecology, wood technology etc. They measure with an accuracy of ± 0·2° C. in the range − 10 to + 50°.

1313. BAUMGARTNER, A., and HOFFMANN, G. Elektrische Fernmessung der Luft- und Bodentemperatur in einem Bergwald. **[Electrical remote**

recording of air and soil temperatures in a mountain forest.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Wien 8B* (2), 1957 (215–30). 7 refs. [G.g.e.f.] L.S.

By installing a series of thermistors at 10 cm. below ground and at 3, 20 and 45 m. above ground (below, within and above crown level) in a mature Spruce stand along a line stretching for 3 km. from the bottom (635 m.) to the top (1325 m.) of the Grosser Falkenstein [cf. *F.A.* 20 Nos. 1350, 1351] and connecting them to a Wheatstone bridge via a switch system, temperature readings at various points could be taken frequently and almost simultaneously from one observation post. The factors influencing mean temperatures (highest on the lower slope), temperature fluctuations, stratification, and the dynamics of air movements on the slope, are discussed in connexion with problems of forest-meteorological site mapping, and examples are given. The daily means of the thermistor readings in the forest were very close to those of thermometer records taken in an adjoining ride 10–15 m. wide.

1314. SHAW, R. H., and MCCOMB, A. L. **A comparison of the Gunn-Bellani radiation integrator and the Eppley pyrheliometer.** *For. Sci.* 5 (3), 1959 (234–6). 7 refs.

Describes the construction and working of the Gunn-Bellani radiation integrator, which gave satisfactory results in tests and may fulfil the requirements of a portable, relatively cheap instrument needing no electrical power, for measuring radiation in the field.

1315. FRIEND, M. T. **A chemical light meter.** *Extr.* from *Rep. E. Afr. Agric. For. Res. Organ. 1958*, 1959 (27–8).

In connexion with the work of the Physics Division on the effect of shade trees on Tea, a short investigation was made to see if a simple and cheap chemical light-integrating meter could be developed to take the place of expensive electrical meters. This would allow a large number of such meters to be distributed over the experimental areas. The basis of the method (described) is that anthracene, which is soluble in C_6H_6, polymerizes in the light to dianthracene, which is insoluble. The method agrees extremely well with the electrical one, but it has not been found possible to use it in the experimental work, because of the lack of suitably trained chemical assistants.

1316. FRIEND, M. T. **Shade measurement by a chemical radiation meter.** *E. Afr. agric. J.* 25 (2), 1959 (110–2). 1 ref.

Describes a chemical method of shade measurement based on spectrographic determination of the concentration of anthracene remaining in solution in bottles after exposure to light [see preceding abstract]. In a pilot experiment to measure the shade afforded by 35- to 42-ft.-high specimens of *Grevillea robusta* planted 40 ft. apart in 8 rows on a 240 × 80 ft. Tea plot at Limuru, Kenya, screened boxes containing bottles of anthracene solution were placed 6 in each row at Tea-bush height, with one box left unshaded as control. The radiation received by each bottle was determined after 3 days, the mean radiation figures obtained indicating that owing to the outside position of the shade trees, the outer were more shaded than the centre rows. The method is considered promising for analysing the over-all reduced intensity of radiation in lightly shaded rows, though it is not suitable where the spectral range may be important, i.e. under heavy shade.

1317. TURNER, H. Über das Licht- und Strahlungsklima einer Hanglage der Ötztaler Alpen bei Obergurgl und seine Auswirkung auf das Mikroklima und auf die Vegetation. **[Light and radiation on a slope in the Ötztal Alps near Obergurgl [Tyrol], and their effect on microclimate and vegetation.]** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Wien 8B* (3/4), 1958 (273–325). 27 refs. [G.g.e.f.] L.S.

Describes lay-out, instrumentation and chief results of studies in or near forest stands on a W.N.W. slope at 1940 m. alt., just below the upper limit of forests, discussing the effects of restricted horizons, and of snow reflection under clear and cloudy skies, stressing the greater importance of diffuse radiation at these altitudes than in the lowlands. The effect of radiation on soil temperature (measured 1 cm. below the surface), particularly maximum soil temperature, was found to depend less on the season than on microclimatic influences, particularly exposure to wind. The effect of radiation on the needle temperature of a young *Pinus cembra* (30 cm. high) was studied [cf. *F.A.* 21 No. 1427]. This temperature, which fluctuated greatly, appeared to be more closely related to air temperature than to radiation. The importance of needle temperatures and of sudden temperature changes, for heat and frost damage, including injury to chlorophyll, are briefly discussed. Radiation values near the ground in (*a*) a closed *P. cembra*, (*b*) a mixed *P. cembra*/*Larix decidua* (⅓ Larch) and (*c*) a pure Larch, stand were measured. In (*a*) they were ca. 8% of those in the open on clear days, and ca. 15% on cloudy days. Values in (*b*) were twice, and in (*c*) three times those in (*a*). The fact that regeneration is completely lacking in the *P. cembra* stands is presumed to be due not to the low relative illumination which, for the 3 summer months, would make a small net assimilation possible, but to the lack of moisture caused by interception. Radiation in or near Larch stands, combined with the protection from wind that they afford, lead to very high soil temperatures, which are held responsible, at least in part, for the paucity and limited variety of soil fauna. First results of measuring the albedo of various plant communities (lichen, dwarf shrubs, herbs) are also discussed.

111.5. Wind

See Nos. 1802–5.

111.7. Humidity, Evaporation. Clouds etc. Precipitation

1318. TAMM, O. F. S. Studier över klimatets humiditet i Sverige. **[Studies on the humidity of**

Sweden's climate.] *Skr. K. Skogshögsk., Stockh.* No. 32, 1959. pp. 48 + 2 maps. 28 refs. [Sw.sw. g.*g.*]

Presents equations for calculating mean annual evapotranspiration (E) from the mean annual temperature, and maps showing distributions of E and of H (a humidity value calculated as the difference between mean annual precipitation and E) in Sweden. On this basis, Sweden is divided into 5 humidity zones from sub-arid ($H < 100$ mm.) to superhumid ($H > 600$ mm.) plus the mountain zone (H 400–1500 mm.).

1319. McCulloch, J. S. G., and Ngethe, S. **Agricultural meteorology.** *Extr.* from *Rep. E. Afr. Agric. For. Res. Organ. 1958*, 1959 (9–13).

The use of tree-top platforms for rain-gauging at the level of the forest canopy [see *F.A.* 20 No. 1349] was rendered considerably more convenient by the use of ¼-in.-diameter tubing of polyvinyl chloride (P.V.C.), by which the rain catches of standard 5-in.-diameter funnels on the high platforms were transferred to large bottles at ground level. The P.V.C. tubing is not wetted, and transmits the water from funnel to reservoir without loss. On each of 9 tree-top platforms, both a standard Snowdon gauge and a gauge equipped with plastic down-pipe and storage reservoir were read daily for 200 days, the observers climbing ladders nailed to the tree-trunks. The mean daily differences averaged 0·003 in., the catch of the standard gauges being slightly less than that of the piped gauges. Some exploratory measurements were also undertaken to find the optimum size of forest clearing in which to expose a rain gauge a little above ground level. Four clearings were made in 35-ft.-high Bamboo, to give screening angles of 30–75°. Observations over 42 rainy days in a 3-month period gave the following results in rain-catch as a % of that in the open: 75°, 87%; 60°, 92%; 45°, 98%; and 30°, 100%. Thus the much smaller 45° clearing gives results approximately equal to those in the open.

111.8. Climatology. Climate and Microclimate

See also Nos. 1533, 1610, 1636, 1648, 1806, 2189, 2208, 2596.

1320. Lowry, W. P. **Studies of Oregon's climate for the forest industry.** *Clim. Note Ore. For. Lds. Res. Cent.* Nos. 1–27, 1959. Each pp. 2–4.

Deal mainly with frequency, persistence and sequence of dry spells and frequency of different forms of precipitation, at different stations. No. 23 is a longer paper (24 pages) viz. 'An introduction to applied climatology for forests'.

1321. Junghans, H. Klimaaufnahmen für forstliche Zwecke. **[Climatic recordings for forestry purposes.]** *Repr.* from *Wissenschaftliche Zeitschrift der Technischen Hochschule Dresden* 7 (6), 1957/1958 (1291–1308). 19 refs. [G.g.]

Describes recordings of temperatures, precipitation and humidity on open spaces in the forest of Tharandt during 1955–57, concentrating on May and June, chiefly in order to test techniques and costs. Existing climatic tables were found to be unreliable and no adequate guide to local climate. Temperature varied more from place to place than precipitation and humidity, and minimum temperatures varied the most and had the greatest influence on periodic mean temperatures. Mobile temperature recordings (from a car or motor cycle) were a useful supplement to fixed instruments. Determination of minima on 5 or 6 clear nights is thought to give a good indication of relative frost danger at a site.

1322. Protopopov, V. V. Mikroklimatičeskie uslovija v zarosljah kipreja (*Chamaenerium angustifolium* (L.) Scop.). **[Microclimatic conditions in dense *Epilobium angustifolium*.]** *Bot. Ž.* 44 (8), 1959 (1143–8). [Russ.]

Measurements of air temperature, humidity and soil temperature during the growing season in dense patches of *E. angustifolium* on an area of taiga Spruce clear-felled six years earlier showed that the weed gives good protection to young Spruce, which should be sown or planted in cleared patches $\ngtr$ 1 × 1 m.

1323. Hagberg, E. Orienterande undersökning över rikets uppdelning i regionala områden med ledning av vid riksskogstaxeringen registrerad radietillväxt. **[A preliminary investigation of Sweden's division into growth regions, based on diameter increment data of the Swedish Forest Survey.]** *Svenska SkogsvFören. Tidskr.* 57 (3), 1959 (403–14). [Sw.]

Index series for annual rings [cf. *F.A.* 16 No. 4405] for the years and/or quinquennia from 1943 to 1957 for Spruce and Pine, based on unstratified survey data, are analysed statistically. A special study of region I (Norrbotten and Västerbotten) suggests that it should be subdivided into growth regions (5 for Pine and 3 for Spruce) to yield series of practical value.

1324. Boughner, C. C., and Kendall, G. R. **Growing degree-days in Canada.** Meteorological Branch, Department of Transport, Canada. 1959. pp. 21 + 9 maps, 1 gph. 6 refs.

Tables show the accumulated degree-day totals above 42° F. for 1957–58 for 146 Canadian stations and the normal monthly and annual growing degree-day values for 80 stations, calculated from their average monthly temperature data. Maps show the growing degree-days for the two years and the calculated normal degree-days, dates of beginning and end of the growing season, etc.

113. Situation.

See No. 2191.

114. Soil. Soil Science

1325. LÅĞ, J. Undersøkelse av skogjorda i Østfold og Akershus ved Landsskogtakseringens markarbeid sommeren 1957. **[Investigations of forest soils in Østfold and Akershus in connexion with the field work of the National Forest Survey in summer 1957.]** *Medd. norske Skogforsøksv.* 16 (2), No. 54, 1959 (97–156 + 3 maps). 24 refs. [Nor. nor.e.]

[Cf. *F.A.* 20 No. 15.] (1) *Soil depths.* Depths exceeding 70 cm. were found on 39·5%, depths of 20–70 cm. on 37·8% and of 0–20 cm. on 22·7% of some 12,000 plots examined. Soil depth appeared to increase somewhat with increasing distance from the coast. Over 75% of the plots had humus layers of < 6 cm. and only just over 10% had layers of > 10 cm. Soil depth and thickness of humus layer both tended to decrease with increasing gradient. Sites rich in grass and in herbs, in moss with herbs, and in *Vaccinium myrtillus* with small ferns, were commoner on deep than on shallow soils and the same was true, though less clearly, of sites with a litter layer and no ground vegetation. *V. vitis-idaea*, *Calluna vulgaris* and lichen sites were more frequent on shallow soils. Sites rich in grass and in herbs, and in moss with herbs, and *V. vitis-idaea* and lichen sites, were most frequent on soils with a thin humus layer. For all vegetation types, increasing thickness of the humus was related to increasing amounts of *Sphagnum*. Spruce was commonest on deep, and Pine on shallow soils. With depths > 20 cm., there was a tendency for Spruce to decrease and Pine to increase with increasing thickness of humus. (2) *Soil types.* About $\frac{3}{5}$ of the plots were morainic, $\frac{1}{6}$ sedimentary, $\frac{1}{6}$ weathered and $\frac{1}{20}$ organic. The weathered soils were generally coarsest and shallowest, with the steepest gradients. (3) *Soils of different mechanical composition.* Most plots were predominantly fine sand, but the weathered soil types contained a large number of plots (54–60%) with coarse sand as the predominant fraction. (4) *Stone content.* About $\frac{1}{3}$ of the plots had a surface soil containing > 1% stones and $\frac{1}{10}$ had > 5%. (5) *Soil profile.* Over $\frac{2}{3}$ of all plots were podzolic and rather over $\frac{1}{5}$ were brown earths. Only 20·3% of the podzolic plots, compared with 74·3% of the brown earth, fell into site classes 1 and 2. Brown earths were fairly frequent under deciduous, mixed deciduous and coniferous, and pure Spruce forest but profile types were more closely related to ground vegetation than to tree species. Sites rich in grass or in herbs and in moss with herbs were found on 5·3 and 55% of the podzolic and brown-earth plots respectively. Podzolic soils with a thick leached horizon were general under *V. myrtillus* and those with a thinner leached horizon under *V. vitis-idaea*, *Calluna* and lichen. Podzolization was more marked where *Sphagnum* was present. Podzolic soils increased in frequency, and the proportion of peat soils increased, with increasing altitude. Coarse and shallow soils were frequently podzolic.

114.1. Soil Physics

See also Nos. 1312–3, 1317, 1322, 1339–40, 1342, 1344, 1353 *et seq.*

1326. BROADFOOT, W. M., and BURKE, H. D. **Soil-moisture constants and their variation.** *Occ. Pap. Sth. For. Exp. Sta.* No. 166, 1959. pp. 27. 111 refs.

A summary and analysis, with a glossary and tables, of data from an extensive U.S. literature and field research at Vicksburg (Miss.) Research Centre on the main "constants" and their relationships to soil texture, land use (forest, pasture and old fields) and aeration, and discussions on the estimation of bulk density, "wet" and "dry" constants, and available water capacity by various methods.

1327. KULIK, N. F. Bločnyj samopisec urovnja gruntovyh vod. **[A pulley-type automatic device for recording ground-water level.]** *Lesn. Hoz.* 11 (10), 1958 (78–9). [Russ.]

The apparatus consists essentially of a revolving clockwork drum with record chart and a pen mounted on a counter-weighted wire running over a pulley. A float of 40 mm. diam. in the observation well is connected to the pen by a glass thread so that the pen traces the fluctuations of level on the chart. The accuracy of the apparatus is said to be ± 0·1 cm.

1328. DEZSÖ, I. Hézagtérfogatvizsgálatok főbb hazai talajtipusokon. **[Investigations on the pore space of the main soil types in Hungary.]** *Agrártudományi Egyetem Mezögazd. Karának Közleményei, Budapest 1958*, 1959 (427–36). [Hu.russ.g.] From *abstr.* in *Soils & Fertil.* 22 (6), 1959 (No. 2698).

Pore volume averaged 43·5% in the subsoil of sands, 38·5% in meadow-clay soils, and 36·9– 37·8% in forest soils.

1329. JASTREBOV, M. T. Estestvennaja radioaktivnost′ zonal′nyh počv Evropejskoj časti SSSR. **[Natural radioactivity of the zonal soils of the European part of the U.S.S.R.]** *Izv. Akad. Nauk SSSR* (*Ser. biol.*) 1959 (3), (390-402). 53 refs. [Russ.russ.e.] A.P.B.

In further investigations [see *F.A.* 20 No. 17], natural radio-activity (n.r.a.) was measured in Aug.-Oct. 1957 along the meridian from the Archangel taiga region to the S. Crimea in: (*a*) strongly podzolic soil under Spruce taiga, (*b*) sod-strongly-podzolic soil under Spruce; (*c*) sod-medium-podzolic soil under mixed forest with Spruce predominating; (*d*) light-grey forest soil under Oak; (*e*) deep leached chernozem under green meadow-steppe vegetation; (*f*) dark chestnut soil under dried-up steppe vegetation; (*g*) red earth and (*h*) brown forest soil both under dried-up montane-meadow vegetation. N.r.a. increased from N. to S.; it was everywhere highest in the top 5 mm. of soil, being 2·2–3·4 times that of the horizon immediately below this depth. N.r.a. in the B_1 and B_2 horizons was 12–33% more than in the A_1, and most of the soil-forming rocks showed 33–50% less n.r.a. than the A_1, B_1, and B_2 horizons developed on them.

114.2. Soil Chemistry

See also Nos. 1335–6, 1339–40, 1342, 1345–6, 1348, 1537, 1543, 1546, 1580, 1768, 1776–7, 1842, 1927–8, 2190, 2197.

1330. LEAF, A. L., and WILDE, S. A. **Decomposition products of sloughed root tissues promote release of available nutrients.** *For. Res. Note Wis. Coll. Agric.* No. 49, 1959. pp. 2.

A revision of *For. Res. Note* No. 40 [see *F.A.* 19 No. 2634], giving different % results.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 1342, 1345, 1349, 1392, 1546, 1584, 1776–7, 1919, 1927–8.

1331. SCHAUFELBERGER, P. **Whiteside's soil-horizon designations and the modified Pallmann system.** *Soils & Fertil.* 22 (6), 1959 (411–7). 11 refs.

Both systems, which the author here compares, attempt to characterize soils by (1) water movement in soil, (2) humus content, (3) base content, and (4) composition of exchangeable and soluble bases. These are sufficient for classifying and defining plains soils, but the endopercolative forest soils also require the leaching factor for characterization. Both systems start from different soils, but reach much the same results under different names and the 6 dynamical soil classes thus defined correspond with Stremme's vegetational soil types.

1332. DUCHAUFOUR, P. La dynamique du sol forestier en climat atlantique. **[Forest soil dynamics in an Atlantic climate.]** Laval University Press, Quebec. 1959. pp. 72. 65 refs. [F.e.g.]

Lectures given at Laval University. Summarizes the findings of the author's book on soil science [see *F.A.* 18 No. 1226], and the most recent research in Europe.

1333. DUCHAUFOUR, P. Le climax du sol. L'évolution progressive et l'évolution regressive des sols forestiers. **[The soil climax. Progressive and regressive evolution of forest soils.]** *An. Inst. Agron., Lisboa* 22, 1955/1958 (1–8). [F.] C.G.B.

Taking the concept of climax to signify an equilibrium of soils with climate and vegetation, examples of climax and regression are briefly described in (1) Atlantic Oak forest, and (2) Mediterranean *Quercus ilex* forest. The significance of such studies for the afforestation of degraded soils is discussed.

1334. LÅG, J. **Preliminary report on calculations of quantitative relationships between soils and soil-forming factors.** *Acta Agriculturae Scandinavica, Stockholm* 8 (3), 1958 (279–84). 12 refs. [E.e.] A.P.B.

The effects of simple soil-forming factors or groups of factors have been measured numerically by the changes they cause in the podzol/brown-earth ratio. Results from Norwegian forests show that the proportion of podzol to brown earth increases with increasing altitude and decreases with increasing gradient. At a rough estimate, a change from one of 4 gradient classes (0–10, 10–20, 20–33, and > 33%) to the next is compensated by a rise of 150 m. in altitude.

1335. KAURIČEV, I. S., KULAKOV, E. V., and NOZDRUNOVA, E. M. K voprosu ob obrazovanii i migracii železoorganičeskih soedinenij v počvah. **[The formation and migration of Fe-organic compounds in soils.]** *Počvoved.* 1958 (12), (1–8). 23 refs. [Russ.russ.e.] A.P.B.

In laboratory experiments, aqueous extracts from Spruce needles, Birch leaves, or hay, allowed to decompose for 1–12 months in different moisture conditions (aerobically, with optimum moisture; and anaerobically, with excess moisture) were allowed to act upon a gleyed sod-podzolic soil. The extracts from anaerobically decomposed material contained more soluble organic matter, and extracted more FeO from the soil, than did the products of aerobic decomposition. The content of organic Fe compounds was considerable, especially in the extracts made with products of anaerobic decomposition. These extracts, and natural soil water from a peat-gley soil (filtered), were subjected to electrodialysis, which showed that, in both, the soluble Fe was present both in cationic form and also in a complex Fe-organic anionic form. When filtered through a sod-horizon sample, most of the cationic FeO was held in the soil, while most of the organic FeO complex was recovered in the filtrate. A sample of the sod horizon of an excessively wet soil, containing FeO in considerable quantity, was extracted with distilled water in a stream of CO_2. After oxidation by exposure to air, the colloidal solution obtained had a negative charge. Passage from ferrous to ferric types of compound was accompanied by the formation of finely dispersed or molecular soluble Fe-organic complexes of high stability. Results are also tabulated from observations in the three growing seasons 1955–57 on the FeO content and the redox potential in various podzolic soils under Spruce forest, meadow, and ploughed land in Moscow province. The lowest redox potentials occurred in spring and the highest in summer, with some decrease in autumn. The sharpest seasonal variations were found under forest. In all cases, redox potential values increased down the profile (to 55–60 cm.). The FeO content was highest in spring in the top horizon. Both laboratory and field experiments indicate that mobile forms of Fe may be formed where reducing processes occur under anaerobic conditions during temporary waterlogging of the soil. [C.f. *F.A.* 20 No. 1363.]

1336. LIVENS, J., and VANSTALLEN, R. Extraits aqueux de litières en décomposition: leur réaction et teneur en bases. **[Water extracts of decomposing litter: their reaction and base content.]** *Agricultura, Louvain (Sér. 2)* 5 (1), 1957 (99–119). 6 refs. [F.f.du.e.] C.G.B.

[Cf. *F.A.* 20 No. 4068.] Water extracts of the litter from a *Querceto-Carpinetum* on podzolic loess loam after passing through the soil became enriched with Ca and impoverished in K, both processes reaching a maximum in the B–C horizon; pH remained relatively constant. In further tests, the chemical composition of litter of Birch, Beech, Oak, Ash, Maple, Hornbeam, Hazel, Lime, Elm, Bird Cherry and Spruce was determined before and after watering, every week for a whole year. Examination of the pH, and Ca and K contents of aqueous extracts at different periods showed leaching losses of K to be 60–97 and of Ca < 5–20%, both varying with species; pH varied little between species or with time. Leaching of K and the acidity of humus in a Beech forest depended on the type of ground flora; leaching of Ca did not.

1337. Omzetting van organisch materiaal in de grond. **[Breakdown of organic material in the soil.]**

Meded. Inst. Toegep. Biol. Onderz. Nat. No. 44, 1959 (14–24, 36). [Du.e.]

Presents the 1958 data for the Oak etc. of Hackfort forest [cf. *F.A.* 20 No. 1383], from which are drawn the following conclusions: macrobiological breakdown of litter occurs from Dec. to April-May, and is caused mainly by the soil fauna. Microbiological breakdown occurs in the summer, and causes chemical changes, in particular a high production of CO_2 and considerable decomposition of cellulose. Litter from the mull types was broken down considerably faster than that from the mor type, by both soil macro- and micro-fauna. There were some differences from the 1957 results, these being caused by the different weather in 1958.

1338. KNOWLES, R., and LAISHLEY, E. **Factors in forest-tree litter extracts affecting the growth of soil micro-organisms.** *Nature, Lond.* 184 (4693), 1959 (1169). 7 refs.

A comparison was made of the growth of two fungi (*Rhizopus nigricans* and *Aspergillus niger*) and two bacteria (*Azotobacter* sp. and *Pseudomonas fluorescens*) in nutrient broth containing leaf extracts of (1) *Fagus grandifolia* and (2) *Acer saccharum* sterilized in two ways, (*a*) Seitz-filtered and (*b*) autoclaved. The fungi were inhibited by (1*a*) and the bacteria by (1*b*) and (2*b*). The significance and mechanism of the apparently separate bacterial and fungal inhibitors need further investigation. The fungistatic activity of the filtered Beech extract may be related to the well known resistance of Beech litter to decomposition.

1339. UCHIDA, T. **[An investigation of the forest humus layers of the needle-leaved forest in Hokkaido.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 114, 1959 (53–205 + 2 plates). 152 refs. [Jap.jap.e.*e*.]

The humus layers are divided into mull, moder and mor (each with 3–4 subdivisions), the relations with forest species and ground vegetation are discussed, and research findings are given on water-holding capacity and moisture content, chemical properties and organic-matter content of each type, and their bearing on natural regeneration. [Cf. *F.A.* 20 No. 24.]

114.4. Soil Classification. Soil Types

See also Nos. 1331, 1334, 1537, 2189.

1340. LAMBERTS, D. Onderzoek over de bodemgesteldheid en de groei van naaldhoutbestanden van het provinciaal domein Bokrijk. **[Investigation on soil type and growth of conifer stands at Bokrijk [N.E. Belgium].]** *Agricultura, Louvain* (*Sér. 2*) 7 (1), 1959 (85–106). 12 refs. [Du.du.f.e.] C.G.B.

The investigations were part of a general study on forest sites. The soil survey showed the following types overlying sand: normal podzols on the higher sites; weakly podzolized low-humic gley soils on the lower sites; strongly developed podzols with an extensive A_2 horizon, on small ridges; and mesotrophic peaty alluvial soils. Soil particle size, pH, humus content, C/N ratio, etc. were determined, and the rate of height growth of *Pinus sylvestris* and *P. nigra* var. *calabrica* on plots on the various soil types compared up to the age of 20 years. Curves for both species were analogous, falling off after 15 years. For these two species, and *P. strobus*, *Larix leptolepis* and *Pseudotsuga taxifolia*, comparisons were made (where possible for the same soil types) of the mean top heights, as calculated from the 10 trees having diameters closest to the mean. Conclusions were that the generally very good growth of all species was due primarily to the fertilizing that had been done. Where the water-table was moderately high, growth of *P. sylvestris* was improved by drainage but *P.n.* var. *calabrica* did not need drainage except on the wettest sites. The fact that the latter species did better than *P. sylvestris* on the dry sandy soils was perhaps due more to its lower mineral requirements than to its better drought resistance. *P. strobus*, *L. leptolepis* and *P. taxifolia*, when planted on suitable sites, all did better than *P. sylvestris* and *P.n.* var. *calabrica*.

1341. GARCÍA NAJERA, J. M., RIPOLL GÓMEZ, D., and JIMÉNEZ AIZPURÚA, A. Sección de influencia física de los montes, hidráulica torrencial y conservación de suelos. Conservación de suelos. **[Section for the physical influences of forests, torrent training and soil conservation. Soil conservation.]** *An. Inst. For. Invest. Exp. Madrid* 30 (3), 1958 (50–5 + 1 tbl.). [Span.]

Presents a general classification of soils according to their suitability for agriculture or forestry.

1342. ZONN, S., *et al.* Nekotorye voprosy razvitija gorno-lesnyh počv pod elovymi lesami v Zapadnyh Rodopah. **[On the development of montane forest soils under Spruce forests in the Western Rhodope Mts.]** *Izvestija na Počvenija Institut, Bălgarska Akademija na Naukite, Sofija* No. 5, 1958 (3–31). 6 refs. [Russ.bulg.g.] H.S.B.

The Spruce forests are found on dark, non-podzolized montane-forest soils. Five different types are distinguished, and the results of chemical and physical analyses of their soils presented and discussed. The soils generally had high contents of Fe_2O_3, Al_2O_3, and humic and fulvic acids. It appears that the genetic characteristics of the dark Spruce forest soils are determined largely by the properties and composition of the humus and litter. The basic genetic and forestry differences between these soils and the other types of soil formation known in literature demand that these soils be classified as a new, endemic soil type, characteristic as yet only for Bulgaria.

1343. LIVEROVSKIJ, JU.A., and RUBCOVA, L. P. Shema klassifikacii počv ravninnyh territorij Dal′nego Vostoka. **[A scheme for classifying soils of the plains of the [Soviet] Far East.]** *Počvoved.* 1959 (4), (60–70). 3 refs. [Russ.e.] A.P.B.

Presents a scheme for soils of (1) the taiga zone, (2) the E. Asian coniferous/broadleaved forest and grassland zone.

1344. ZONN, S. V. O nekotoryh zakonomernostjah formirovanija i vertikal′no-zonal′nogo raspredelenija počv v tropičeskih i subtropičeskih oblastjah jugo-zapadnogo Kitaja. **[Some features of the formation and zonal vertical distribution of**

the soils in the tropical and subtropical regions of S.W. China.] *Počvoved.* 1959 (9), (12–21). 1 ref. A.P.B.

A short account of work done in 1957–58 in Yunnan Province in the mainly yellow-earth region bordering on Burma, Laos and Viet Nam. Data are given on the chemistry of the soils under tropical and subtropical rain forest and under secondary Bamboo, the altitudinal distribution of soils, soil moisture, and the CO_2 content of soil air under different vegetation types, etc.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 1338–40, 1349, 1543–4, 1580, 1700, 1772, 1927–8, 2189, 2190, 2197.

1345. WILL, G. M. **Nutrient return in litter and rainfall under some exotic conifer stands in New Zealand.** *N.Z.J. agric. Res.* 2 (4), 1959 (719–34) 22 refs. O.R.E.

[Cf. *F.A.* 17 No. 1203.] As part of a study of the changes taking place in pumice soils under exotic conifers, monthly litter-fall collections were made for several years under *Pinus radiata*, *P. nigra* var. *calabrica*, *Pseudotsuga taxifolia* and *Larix decidua*. While the nutrient composition of the litters was similar to that reported from other countries, the total annual weights were greater in New Zealand. Under both Pines, the air-dry weight of litter falling averaged > 5000 lb./acre/year, and in one year was > 8000 lb./acre. The rate of needle-fall under *P. taxifolia* did not vary greatly with season; most *P.n.* var. *calabrica* needles fell in the autumn; under *P. radiata*, peak needle-fall was also in the autumn but considerable quantities of needles fell throughout the year, especially in young stands. Storms affected the fall of twigs and branches from all species. The annual rainfall reaching the ground under *P. taxifolia* contained about as much P and at least twice as much K as the litter falling on the same area. Under *P. radiata* the proportions of these nutrients in the rain water were smaller, but still significant. This removal of nutrients from the crowns reached a maximum in late summer and autumn. In *P. radiata* forests where the Na content of the soil was high, the Na content of the litter from mature trees was also high, and rain water gained additional Na from the crowns.

1346. VOMPERSKIJ, S. Ė. O metodike ocenki bolot v lesomeliorativnyh izyskanijah. **[Methods of assessing wet peatland in surveys with a view to forest site improvement.]** *Lesn. Hoz.* 11 (11), 1958 (76–7). [Russ.]

In deciding on drainage schemes to improve forest sites it should be remembered that the ash content (a.c.) of the peat governs the site class: thus, for Pine in the N.W. of the U.S.S.R., peat of ⩾ 5–6% a.c. results in Class I sites; peat of < 2% a.c. Classes IV–V. Spruce grows well only on peat of a.c. ⩾ 8–10%. A layer of poorly decomposed peat > 40–50 cm. deep makes the site unsuitable for tree growth, irrespective of the a.c. of the peat. Analysis of the botanical composition of the peat is sufficient in some cases to assess suitability for Pine after drainage.

114.6. Soil Biology

See also Nos. 1337–8, 1542, 1547, 1705, 1984.

1347. **[Methods of studying soil fungi.]** *Extr.* from *Rep. Nat. Conservancy, Lond. 1958/59*, 1959 (52).

The construction of a projection system has greatly improved the nylon-mesh technique for measuring fungal activity. Using a mercury-vapour lamp and prism, the image of the mesh is thrown on to a screen, so that the operator can scan the meshes rapidly and take direct measurements of hyphal lengths without undue fatigue. [Cf. *F.A.* 19 No. 1306.]

1348. MOREAU, R. Sur la libération biologique dans les sols de phosphates solubles à partir de composés phosphorés insolubles. **[Biological liberation in soils of soluble phosphates from insoluble P compounds.]** *C.R. Acad. Sci., Paris* 249 (18), 1959 (1804–6). 4 refs. [F.f.] O.R.S.

Cultures of the microflora of three poor soils of a forest in the Haute-Saône already studied [cf. *F.A.* 20 No. 4586] showed the presence of fungi and bacteria capable of liberating soluble phosphates from insoluble P compounds.

1349. MOREAU, R. Sur la microflore de quelques terres de sapinières. **[The microflora of some soils of Silver Fir forests.]** *C.R. Acad. Sci., Paris* 249 (12), 1959 (1053–5). 2 refs. [F.f.] O.R.S.

Qualitative differences were found in the fungus flora of soils of 4 Fir forests in the Doubs, one consisting of mixed hardwoods with 15-year regeneration of *Abies alba*, and the others of pure Fir, 60 and 120 years old (with regeneration), and 200 years old (without regeneration). Extracts of the humus from the last and from a Beech forest (both on rendzina soils), when used as growth media for the microflora of the 60-year forest, exerted an inhibiting effect, probably partly toxic and partly resulting from lack of nutrients; the effect of the extract from the Fir humus was more marked than that from the Beech. [Cf. *F.A.* 21 No. 1927.]

1350. WALLWORK, J. A. **The distribution and dynamics of some forest soil mites.** *Ecology* 40 (4), 1959 (557–63). 26 refs.

The distribution and population dynamics of oribatid mites and Collembola were investigated in litter, humus, and mineral layers of a Hemlock/Yellow-Birch mor. The greater part of the fauna was found in the top 7–10 cm. of the profile, which was made up of a litter and humus layer. During the summer, the number of mites was ca. 4 times that of Collembola in all layers; in winter a decrease in numbers occurred in the litter, but the humus population was more than double that in the summer. Population changes of several common oribatid mites are discussed. *From author's summary.*

1351. RONDE, G. Waldboden-Düngung und Kleinfauna. **[The effect of forest fertilizing on soil**

fauna.] *Allg. Forstzeitschr.* 14 (42), 1959 (742). 1 ref.

In a preliminary report on trials on a compacted, wet, silty loam under 86-year Spruce at Ochsenhausen, S. Württemberg, started in 1955 with (*a*) $(NH_4)_2SO_4.NH_4NO_3$, (*b*) gaseous NH_3, and (*c*) gaseous $NH_3 + P + Ca$, a diagram of the absolute and relative frequency of Collembola, acarids, lumbricids etc. found in 1957 and 1958 is presented. Total populations were greater on all treated plots than on controls, least in (*a*) and most in (*c*), which also showed the greatest changes in species composition and increase in lumbricids. [Cf. *F.A.* 20 No. 4544; 21 No. 475.]

1352. LELLÁKOVÁ-DUŠKOVÁ, F. Příspěvek poznání makroedafonu smrkového lesa. **[The macrofauna of soils of Spruce forests.]** *Zool. Listy, Brno* 8 (4), 1959 (315–27). 23 refs. [Cz.cz.g.*g*.] O.R.S.

Soil samples, 25 × 25 cm. in area and 13–20 cm. in depth, were taken from a 40- to 50-year plantation of pure Spruce; the organic and mineral layers of the samples were separated and the populations of Vermes, arthropods in general, and insects were determined. Total numbers increased in May–July, decreased in August and again in October-November, and rose again in December. Tables are given showing the various populations present at monthly intervals from May to Dec. 1955, and in March and July 1956.

116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 1318–9, 1327, 1424, 1758–60, 1764–5, 1802, 1804, 1925.

1353. **Symposium of Hannoversch-Münden 8–14 Sept. 1959 Volume I. Water and woodlands. Volume II. Lysimeters.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* Nos. 48 & 49, 1959. pp. 342; pp. 169 + 2 dgms. Many refs. [E.G. or F., e.g.f. or esper.] Price [£3. 4*s*. 9*d*.]

Vol. I includes, in addition to papers referenced separately in this number of *F.A.*, the following: Forest catchment research and methods used in the United States (*H. C. Storey*), Forests and floods in the Northwestern United States (*H. W. Anderson* and *R. L. Hobba*), Frost and forest soil (*H. W. Lull* and *R. S. Pierce*), Management of forest stands in Western United States to influence the flow of snow-fed streams (*B. C. Goodell*), Increasing water yields by cutting forest vegetation (*H. G. Meginnis*) [all mainly reviews of American research]; Prediction of soil moisture from soil and weather records (*H. D. Burke* and *W. J. Turnbull*) [for estimating the capacity of soils to carry vehicular traffic]; Systematics and nomenclature of water balances (*J. Lambor*); Water and woodlands: investigations in the United Kingdom into water relationship of woodlands, and the problems of measuring rainfall over woods (*A. Bleasdale*) [a brief review of recent research, discussing particularly the likelihood of turbulence over small woods or small forest clearings affecting the distribution of rainfall]; Four years' experience in attempting to standardize measurements of potential evaporation in the British Isles and the ecological significance of the results (*F. H. W. Green*) [cf. *F.A.* 18 No. 3665]; Measurements and interpretations of interception by forest stands (*L. Leyton* and *A. Carlisle*) [discussing, with examples from interception under a 22-year-old *Chamaecyparis lawsoniana*, the great fluctuations in through-fall owing to meteorological factors, distribution of crown cover etc., and stressing the need for a statistical approach]; Alpine snow fields—their characteristics and management possibilities (*M. Martinelli, Jr.*) [discussing snow-melt studies in the Rockies above the timber-line, including techniques of acceleration or retardation by covering the snow surface with e.g. soot or sawdust]; The moisture flow technique for determining the water-balance (*W. C. Visser* and *G. W. Bloemen*) [discussing the principal equations of the method, which showed good correspondence with lysimeter results at the Rottegatspolder, Netherlands]; A contribution to the elucidation of the evapo-transpiration of forest stands on clayey soils with a high groundwater table (*H. Holstener-Jørgensen*) [cf. *F.A.* 20 No. 4252]; and Nature protection and water economy (*J. Lambor*) [discussing water deficiencies in parts of Poland and the phenomenon of steppe encroachment]. Vol. II contains 17 papers on installations and research in Austria, Germany, Hungary, the Netherlands, Russia, tropical countries, and the U.S.A., mostly on general and agricultural hydrology except three, abstracted separately, and one on Lysimeters in the Netherlands (*G. F. Makkink*) [briefly describing the Castricum (N. Holland) installation designed to study the effect of Pine and broad-leaved deciduous woods on the supply of drinking water, and containing a bibliography of 52 references].

1354. LEYTON, L.; GREEN, F. W. **Effects of forest areas on water resources and the technique of lysimetry.** *Nature, Lond.* 184 (4694), 1959 (1184–7).

Summarizes the two parts of the symposium held Sept. 1959 at Hann. Münden [see preceding abstract].

1355. WICHT, C. L. **The management of water catchments [with discussion].** *Sols Africains, Paris* 4 (3), [1958?] (21–51 + 2 photos). 10 refs. [E.F.e.f.]

A lecture discussing hydrological and ecological aspects, and stressing the need for adapting bionomic and structural measures to the purposes of the area, whether (*a*) maximum clear water for reservoir storage is required, or (*b*) maximum stabilized stream discharge for direct utilization, (*c*) a combination of the two, or (*d*) minimum stream discharge and maximum use of water within the catchment itself. Judicious exploitation of forests is not considered to be necessarily detrimental to their role in flood control. Thinning or changing the natural forest cover, particularly phreatic vegetation, may be necessary for increased yields.

1356. MARGAROPOULOS, P. Quelques façons d'aborder l'évaluation quantitative des fonctions hydrologiques des forêts, et notamment de celles des bassins de reception des petits fleuves, torrents, etc.

[Some ways of tackling the quantitative evaluation of the hydrological functions of forests, particularly those of the catchments of small rivers, torrents, etc.] [*Docum.*] *10th Sess. FAO European For. Comm., Rome 1959* No. *FAO/EFC* 59/46, 1959. pp. 12. [F.]

After discussing the inherent difficulties of such evaluation and the scantiness of the available data, even in the U.S.A., the author first sketches the methods of investigation currently employed, and then makes some suggestions for evaluation. He proposes that a proportion of 7 ha. of protective forest to 1 ha. of protected land, should be assumed and the hydrological value of the forest evaluated on this basis. In order to determine the value of the forest in preventing or controlling erosion, it is important first to delimit those areas where only forest cover can achieve control, distinguishing them from areas of superficial erosion, which could be protected by grass etc. The next stage would be to make quantitative estimates of the soil eroded on the former type of eroded site. Methods of assessing sedimentation of reservoirs etc., and costs of afforestation for torrent control are also discussed.

1357. FRÈRE, M. Équipement d'un petit bassin de forêt équatoriale en vue de calculer son bilan hydrologique. **[The hydrological equipment of a small catchment area in equatorial forest.]** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (150–4). 5 refs. [F.f.e.]

Describes the equipment of an experimental catchment area of 46 sq. km. of the river Loweo near Yangambi (Belgian Congo), consisting of 15 rain gauges read at weekly intervals along with 4 recording gauges measuring rain intensity, and a Parshall flume. Preliminary results indicate that 20–25% of the rain falling on the area passes the flume, a figure in good agreement with Bernard's estimates for the Congo basin as a whole. [Cf. *F.A.* 16 No. 2619.]

1358. POPOV, O. V. **Lysimeters and hydraulic soil evaporimeters.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 49, 1959 (26–37). 13 refs. [E.e.f.]

Describes, with illustrations, the construction and working of 3 Russian types of lysimeter incorporating hydrostatic scales, viz. (*a*) the large "hydraulic evaporimeter" at Valdai Hydrological Laboratory, weighing 18 tons, 5 sq. m. in area and 2 m. deep; (*b*) forest soil evaporimeters, 9 tons, 3 sq. m., 1·5 m. and (*c*) small lysimeters 0·2 sq. m. × 1·5 m., designed for use in a network of climatic stations. A set of (*b*), mounted on trolleys running on rails so that they can be moved from the forest to a central hydraulic weighbridge of great accuracy, are used at Valdai Laboratory for studying diurnal and seasonal courses of evapo-transpiration of trees up to 20 years old in near-natural surroundings.

1359. BOCHKOV [BOČKOV], A. P. **The elements of the water balance in the forest and on the field.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (164–73). 5 refs. [E.e.f.]

Presents and analyses data on precipitation (x) and run-off (y), chiefly from forested and open plots from the Valdai Hydrological Station, the Bukhanskaya Station near Kiev and the Bolshoe Sareevo Station near Moscow, concluding that other factors are of greater importance than vegetative cover. A comparison between two small catchments, (*a*) forested, (*b*) open, showed throughout the year no differences in snow accumulation nor in summer y, but for (*b*), greater y in spring and summer, and smaller $(x - y)$ (considered as a measure of evapo-transpiration). The differences between the $(x - y)$ values were fairly constant throughout the year, a fact that is interpreted as indicating the operation of factors other than transpiration, e.g. subsurface run-off. An experiment is mentioned in which Birch, Pine and Fir [Spruce?] were grown in hydraulic evaporimeters; at 12–22 years summer evapo-transpiration of these trees was found to be less than that of agricultural crops. [Cf. *F.A.* 20 No. 2716.]

1360. VALEK, Z. Beitrag zur hydrologischen und hydrotechnischen Verwendbarkeit der Holzarten. **[The suitability of species for purposes of hydrology and hydrological engineering.]** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (322–40). [G.g.f.]

Summarizes research during 1928–55 on the effect of forests on run-off, including the difference between Beech, Spruce, and Silver Fir, based chiefly on observations of run-off, erosion etc. on two catchment areas, each ca. 4 sq. km., at 500–900 m. alt., in the Vsetin district [N.W. Carpathians], of which one (*a*) was covered chiefly with mixed selection forest, the other (*b*) being half pasture, half arable. In addition to the expected considerable differences in the frequency, intensity (and suddenness) of floods and of low water in streams and wells, and also in the amount of detritus transported by the two small rivers in spite of careless and injurious ground skidding in (*a*), the total run-off from (*a*) was also greater. Precipitation reaching the ground under Beech, Fir and Spruce was found to be 90, 81 and 60% of the total respectively, snow interception in older Spruce stands being particularly high. Infiltration experiments in the root zone of a 50-year-old Beech and 60-year-old Spruce indicated that with artificial rain at 50–100 mm./hr. no run-off developed under Beech, and sub-surface flow started after 30–60 min. at 0·5–2 m. depth, while under Spruce all water ran off on the surface and the ground was generally wetted by rain only to a depth of 30 cm. These factors, combined with the fact that interception by Spruce ceases very quickly under heavy downpours, are thought to explain why Spruce is an unsuitable species from a hydrological point of view; Silver Fir is rated between Spruce and Beech. In a final section, the suitability of 14 stands and trees for stabilization of stream and river banks is discussed, with special reference to the spread of their root systems, establishment, tending, and useful life.

1361. RODIN, A. R. Vlijanie drevesnyh porod v smešannom nasaždenii na vodno-fizičeskie svojstva počv. **[The influence of woody species in mixed**

stands on the hydrological and physical properties of the soil.] *Lesn. Hoz.* 11 (9), 1958 (77). [Russ.]

The studies were made on medium podzolic clay-loam soils overlying heavy loams and clays, in 20-year-old mixed plantations round the Uchin reservoir, north of Moscow. The infiltration capacity of the soil was measured immediately under different species of trees and compared with that of meadow land [season not stated]. Infiltration over periods of 6 hours each on two successive days varied from 544 and 369 mm. under Elm to 213 and 166 mm. under Birch, and 136 and 51 mm. in meadow land. The infiltration capacity of soils under *Tilia* sp., Spruce, Pine and Oak was intermediate between the figures for Elm and Birch. The non-capillary porosity of the A_1, A_2 and B_1 horizons was determined for each of the species and for the soil under meadow. It was greater in all cases in A_1 and A_2 than in B_1, and the highest values were found under Elm, Pine and Spruce. Accordingly these three species, and *Tilia* sp., are recommended for planting on catchment areas round reservoirs.

1362. EIDMANN, F. E. Die Interception in Buchen- und Fichtenbeständen; Ergebnis mehrjähriger Untersuchungen im Rothaargebirge (Sauerland). **[Interception in Beech and Spruce stands; results of investigations over a number of years in the Rothaar Mountains (Sauerland).]** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (5–25). [G.g.e.]

The mean catch in rain gauges placed randomly in 26 Beech and 30 Spruce stands [cf. *F.A.* 19 No. 2662] over the years 1951–55 was in almost the same proportion, i.e. 75·6% of that in the open in Beech and 73·3% in Spruce. The smallness of the difference, which occurred in summer only, was largely due to the greater amount of fog drip, fog being a considerable factor in these hills. But because stemflow, negligible in Spruce, reached up to 20% in Beech in winter, and 16% in summer, net interception by Beech was 7·6% against 25·6% by Spruce, i.e. of an annual mean precipitation of 1216 mm., 1123 mm. reached the ground in Beech, and only 902 in Spruce.

1363. NOIRFALISE, A. Sur l'interception de la pluie par le couvert dans quelques forêts belges. **[The interception of rain by the canopy in some Belgian forests.]** *Bull. Soc. For. Belg.* 66 (10), 1959 (433–9). [F.]

Gives the results of measurements in (1) old Oak/Birch coppice ca. 15 m. high, (2) pure Beech (ca. 20 m. high), and (3) pure Spruce plantations (ca. 22 m. high and thinned to different densities), at different seasons and for different intensities of rainfall. For (1), mean annual interception was 34·8% (ranging from 33·2 to 41·2); separate measurements were also made for stem-flow and for interception by the ground cover of bracken and heath. Canopy interception during May and June 1949 was 25% under (2) and 23% and 38% under thinned and unthinned (3). Stem-flow was negligible for (3) but considerable for (2), amounting to ca. 2% of total precipitation.

1364. SEPPÄNEN, M. **On the quantity of snow lodging on branches of trees in Pine dominated forest on January 16, 1959, during the time of snow destructions in Finland.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (245–7). [E.e.f.]

Measurements and computations carried out at various stations indicated that canopy interception may have exceeded 2600 kg./100 sq. m. of ground in the worst affected areas.

1365. SEPPÄNEN, M. **On a new method of measuring snow cover in forest in Finland.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (248–51). [E.e.f.]

To ascertain the influence of individual trees on snow cover in the forest, snow height was measured by means of sticks set 10 m. apart in and between rows, 108 or 25 per plot. When readings were taken in February, after snow had fallen off branches to the ground, the greater quantity of this snow in dense patches, viz. $>$ 16 trees in any area of 400 sq. m. surrounding a stick, compensated for the smaller amount that had originally reached it compared with less dense patches where the average density of the stand was $\leqslant$ 16 trees/400 sq. m. In denser stands, the fall of snow off the trees caused the densest patches to have most snow and the more open ones (where the total amount directly reaching the ground was great) least.

1366. SOZYKIN, N. F. **Physical conditions of snow thawing and spring drainage in and outside the forest as observed in the environs of Moscow.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (212–26). [E.e.f.]

Analyses the effects of radiation interception (short- and long-wave) and the water-holding capacity of soils on the basis of 10 years' records from the Moskva-Volga catchment. Gives details of vegetation, topography, soils etc. of two catchments (*a*) mainly mixed Fir [Spruce?], Birch and Aspen, (*b*) mainly ploughland and meadows, and comparative data on snow cover, thawing rate, radiation and temperatures during the period of thawing, drainage coefficients etc. for (*a*) and (*b*) for 3 years. The author also gives some data on snow melt, and albedo, turbulence etc. for different types of forest stand, and presents and discusses energy and run-off equations. Snow melt took about twice as long in forests as in fields, ending 10–15 days later; it was also more evenly distributed over day and night, and the peak of spring high-water flow was delayed by ca. 9 days. It is estimated that the decrease in snow thawing rate during the daytime under the forest cover, diminishes the run-off factor on soils of medium permeability by 1·2–5 times compared with that of the open, and that the regulatory capacity of medium podzol loamy soils under Fir [Spruce?] forests, and the additional heat-insulating effect of forest under certain night-time thermal conditions reduces it by another 1·7 to 2 times. [Cf. *F.A.* 20 No. 1389.]

1367. STRIFFLER, W. D. **Effects of forest cover on soil freezing in Northern Lower Michigan.** *Sta.*

Pap. Lake St. For. Exp. Sta. No. 76, 1959. pp. 16. 12 refs.

In winter 1957–58, in stands of (1) northern hardwoods, (2) mixed Oak, (3) planted *Pinus resinosa*, open, ca. 11 ft. high, and (4) as (3) but with closed canopy, 26 ft. high, measurements were made of the depth and type of frost, depth and water content of snow cover, and depth and type of humus layer as factors affecting frost formation. Frost was deepest and primarily of the concrete, impermeable form in (4), where least snow accumulated, and both snow and soil frost lasted longest. This type also had the deepest litter and thinnest humus layer (imperfect mor). Least frost was found in (1), and only slightly more in (2) and most of it was of the granular or 'honeycomb' type, presumably in connexion with the mull structure of the humus. Both had slightly less snow than (3), which was intermediate in depth, duration and % of concrete type of frost, snow melt taking nearly as long as on (4).

1368. RUTTER, A. J. **Evaporation from a plantation of *Pinus sylvestris* in relation to meteorological and soil conditions.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (101–10). 3 refs. [E.e.f.]

Describes investigations in a stand of 10 ha., ca. 10 years old, 7–10 m. high, with a closed canopy, on almost level ground at Crowthorne, Berkshire. Three methods of arriving at total evapo-transpiration were compared and found to agree satisfactorily. (I) determining separately transpiration (by extrapolation from measurements of detached branches or foliage, sampled from various parts of the crown, at different times of day and in different kinds of weather), interception, and evaporation from the soil surface; (II) on the basis of rainfall and changes in soil moisture tension, measured by tensiometers and electric resistance blocks to a depth of 240 cm., and (III) changes in soil water storage in the profile down to 120 cm. Transpiration (expressed as loss of water per unit of dry foliage, or as mm./day for the whole plantation) and measured solar radiation fluctuated together fairly closely. Total evapo-transpiration was fairly closely related to Penman's estimate of the potential evapo-transpiration of grass computed for a neighbouring site, but exceeded it in April–Sept. 1957 by 15% and April–Sept. 1958 by 36%, the difference being most marked when interception was great. Interception for April–Sept. 1957 was 27% (rainfall 30·2 in.) in 1957 and 35% (rainfall 36·7 in.) in 1958, with winter figures of 27% (36 in.) and 29% (27·3 in.). The rate of evaporation of intercepted water greatly exceeded the transpiration rate, particularly in winter. On a sub-plot which has been protected from rain by a cover of roofing felt over the soil, calculated soil water deficit rose to nearly 20 cm. in Sept. 1958, but neither transpiration nor leaf water deficit [cf. *F.A.* 21 No. 224] was appreciably affected as compared with an irrigated sub-plot maintained near field capacity.

1369. SINCLAIR, J. D., and PATRIC, J. H. **The San Dimas disturbed soil lysimeters.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 49, 1959 (116–25). 6 refs. [E.e.f.]

Briefly describes the installation [cf. *F.A.* 10 No. 891] and the preliminary results of the third phase of research, since 1946, when some lysimeters were planted with *Pinus coulteri* (*a*), some with chaparral species (*b*), some with grasses (*c*), and one left bare (*d*). Both in 1956–57 (winter rainfall 20·3 in.) and 1957–58 (48·4 in.) run-off was much the greatest in (*d*) followed by (*c*). It was lower in (*a*) in the wet year, and in (*b*) in the dry year. Seepage in 1957–58 was greatest in (*c*), followed by (*a*); in 1956–57, it occurred only in (*c*), which also reached field capacity every year, the grass using little moisture beyond a depth of 4 ft., whereas (*a*) and (*b*) have reached wilting point every year since 1952. Evapo-transpiration was considerably greater in (*a*) and (*b*) in 1957–58 than in 1956–57, but about the same in both (*c*) and (*d*), (*a*) losing less than (*b*) in the dry year. All woody species grew less well in the lysimeters than in unconfined control plots, the height of *P. coulteri* in 1958 being 11 and 17 ft. respectively. This fact, whether due to root restriction or to abnormal moisture conditions, somewhat limits the usefulness of such studies with deep-rooting plants.

1370. ZINKE, P. J. **The influence of a stand of *Pinus coulteri* on the soil moisture regime of a large San Dimas lysimeter in Southern California.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 49, 1959 (126–38). [E.e.f.]

A detailed comparison of soil moisture changes, infiltration, run-off and evaporation for the years 1946/47–1955/56, in sandy, clayey loam of a lysimeter (*a*) that had been planted with one-year stock in 1946 and was carrying, in 1956, 19 trees with a total b.a. of 0·0418 sq. m. and a height of ca. 4 m., while lysimeter (*b*) was left bare [cf. preceding abstract]. An equation for the quantity of soil moisture (*Qsm*) was developed, of the form $Qsm = Qsm_o e^{-kt}$, in which Qsm_o is initial soil moisture, *t* drying time and *k* a constant which was 0·0097 for (*a*) and 0·0069 for (*b*). In (*a*) the rate of loss was about equal for all depths, moisture being removed from successive layers (starting at the top) until the whole 6-foot block was dry, while in (*b*) the rate decreased with depth and reached zero at 4½–5 ft. Evaporation losses in (*a*) were generally higher than those from an evaporation pan, and were constant in the early part of the drying season even when those from the pan increased. Towards the end of the season they decreased because of approaching moisture exhaustion.

1371. METZ, L. J., and DOUGLASS, J. E. **Soil moisture depletion under several Piedmont cover types.** *Tech. Bull. U.S. For. Serv.* No. 1207, 1959. pp. 23. 11 refs.

Data are presented on soil moisture observed under forest cover, old-field vegetation, and bare soil. (1) The withdrawal and recharge of soil moisture is cyclic, repeating itself each year. Recharge begins in the late autumn or winter, and depletion begins with the start of the growing season, continuing until late autumn. During dry years, the soil may not be recharged to field capacity.

(2) Summer precipitation adds moisture to the soil surface layers beneath vegetation; but, even with very heavy rains, the water is quickly used by evapo-transpiration, so that for all practical purposes it does not move below 30 in. Low infiltration rates limit the recharge of soil moisture in barren eroded soils. (3) Depletion of soil moisture lends itself to curvilinear analysis by depths or profile and cover types. Forest types appear to deplete soils of moisture to depths of at least 66 in. at relatively the same rate regardless of species. Under old-field herbaceous vegetation and bare soil, moisture is lost primarily from the surface 30 in., although slight losses occur at greater depths. (4) Moisture loss from all soils is related to depth. With increasing depth of soil, the rate of moisture loss decreases. Under vegetation this is a reflection of root concentration, while from bare soils it is a reflection of the characteristics of evaporation from soil. *From authors' summary.*

1372. KOSHI, P. T. **Soil-moisture trends under varying densities of Oak overstory.** *Occ. Pap. Sth. For. Exp. Sta.* No. 167, 1959. pp. 12. 11 refs.

In a 2-year study in Texas comparing (*a*) an undisturbed stand with a b.a. of 65 sq. ft./acre, (*b*) a thinned plot with b.a. 26 sq. ft., both predominantly Post Oak [cf. *F.A.* 19 No. 1741], and (*c*) a cleared, predominantly grassy plot, moisture content in the top 2 feet of soil was nearly always greatest under (*c*) and least under (*a*), most of the difference occurring in the lower foot of soil. Maximum depletion rates at times of abundant moisture were about equal (nearly 0·2 in./day), as also at the absolute minimum m.c., which was lower than the wilting point computed in terms of m.c. at 15 atm., but periods of moisture stress were shortest and least frequent in (*c*). This plot had generally, but not always, the highest accretion rates, while its winter depletion rates were much the lowest. Tree roots absorbed moisture about equally from all layers, grass roots withdrew it from the second foot only in times of low moisture. Differences in soil compaction, permeability etc. are thought possibly to be factors contributing to the differences observed but not wholly accounting for them. During winter the soils of (*c*), being saturated, had less capacity for storing rainfall or checking run-off and flooding.

1373. URIE, D. H. **Pattern of soil moisture depletion varies between Red Pine and Oak stands in Michigan.** *Tech. Note Lake St. For. Exp. Sta.* No. 564, 1959. pp. 2.

A study of two dense plantations of *Pinus resinosa*, aged 25 years, and two of natural Oak scrub, 60–70 years old, both on sandy soils. Under both vegetation types, available moisture fell from 5·78 in. (field capacity) in the top 7 in. in April to 1·8 in. in mid-Aug., rising to near field capacity again in Oct. Both types utilized most of the stored moisture, but while under the Pines the depletion was fairly uniform, starting in April and May, it was negligible under the Oaks until after full leaf development in June.

1374. HORTON, J. S. **The problem of phreatophytes.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (76–83). 14 refs. [E.e.f.]

Discusses ecology, water consumption and control of various types of phreatophytic vegetation (largely trees and shrubs) along the water-courses and in the flood-plains of the South-West of the U.S.A., with special reference to *Tamarix pentandra.* The most promising method of controlling this Mediterranean species, which has invaded large tracts and which lysimeter and vapour-loss experiments have shown to transpire at a very high rate, was by root ploughing, followed by burning and later by spraying with growth-regulator herbicides, 2-(2,4,5-trichlorophenoxy)propionic acid (Silvex) proving the most effective.

1375. PEREIRA, H. C., *et al.* **Water and crop growth. The water use of trees and crops and the effects of land-use on streamflow and local government. Catchment area research.** *Extr.* from *Rep. E. Afr. Agric. For. Res. Organ. 1958*, 1959 (6–9).

Outlines the various catchment-area research projects now in progress in Kenya and Uganda. Many gloomy opinions of the water-use of Kenya forests have been based on river-gauging at lower altitudes, together with estimates of rainfall over the forest that were little more than guesswork. With a close network of rain gauges, read daily or autographic, and with stream gauges sited within the forest, very different results are emerging; valleys under dense Bamboo are yielding $> 50\%$ of the rainfall as stream flow, and this rises to 70% where Bamboo has been replaced by newly planted Pine intercropped with vegetables.

1376. PEREIRA, H. C. **A physical basis for land use policy in tropical catchment areas.** *Nature, Lond.* 184 (4701), 1959 (1768–71). 11 refs.

Summarizes the progress made so far in the hydrological studies of catchments in Kenya [cf. *F.A.* 20 No. 2722].

1377. HOLSTENER-JØRGENSEN, H. Skov og grundvand. **[The forest and ground-water.]** *Dansk Skovforen. Tidsskr.* 44 (10), 1959 (509–28). 13 refs. [Dan.]

An outline of research, based mainly on the author's own work [cf. *F.A.* 20 Nos. 2164, 4251–2], covering the effect of the ground-water on the soil, plants indicating high water-tables, interrelationships of the forest and the ground-water, the effect of felling, etc.

1378. RAKHMANOV [RAHMANOV], V. V. **The influence of forests on groundwater level.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (182–96). 30 refs. [E.e.f.]

Argues, on a re-appraisal of earlier and recently published data, that the lower ground-water levels commonly found in forests are due to hydrogeological and/or soil factors [e.g. high infiltration capacity] rather than greater evapo-transpiration (which should allow the levels to rise in winter, as they do not) and adduces examples of almost equal levels in field and forest from the second terrace of the Dnieper and other places.

1379. LEBEDEV, A. V. **On the question of controlling groundwater run-off by Pine and Fir [Spruce?] forests.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (302–9). [E.e.f.]

A detailed hydrodynamic analysis based on borehole measurements of groundwater and soil-moisture fluctuations over the years 1950–53 on 3 plots (each of ca. 10 ha.) on a low, comparatively flat watershed between two small rivers flowing into the basin of the Moskva and Klyazma rivers. Comparisons (tabulated) between a 60-year conifer stand (*a*) and a clearing (*b*) on fluvio-glacial sands overlying a deep impermeable clay, with groundwater at 2·5–4 m., clearly showed the regulating effect of the forest over the years. Observations on or near a poor, wet site with a perched water table at 0·5–1·5 m. (*c*) showed the forest's role in biological drainage. Total evaporation from (*a*) was less than from (*b*) despite greater evapo-transpiration from the zone of aeration, because the much higher rate of infiltration reduced surface evaporation by more than the higher transpiration losses. Sub-surface run-off from (*a*) occurred every year while in (*b*) the water balance became negative in dry years, though in wet years groundwater recharge from precipitation exceeded that in (*a*). Lateral accession of groundwater was greater in (*a*) over the period as a whole and at times when seepage into the soil was < 60 mm. a month, but smaller when seepage was > 60 mm. In (*c*) evaporation consistently exceeded precipitation, and was greater inside the forest than on the forest margin; it increased with decreasing precipitation. Recharge of groundwater losses came as lateral seepage from forest ponds in slightly elevated marshy areas.

1380. KOROBEINIKOV [KOROBEJNIKOV], V. A. **Subsoil water of Kamennaya steppe and the influence of forest strips upon its regimen.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (227–37). 14 refs. [E.e.f.]

Discusses data on well levels in the Talov district of Voronezh, dating back to the planting of the first shelterbelts in 1892, and the pattern of levels and their fluctuations as affected by type and age of stands, soil, topography etc. Because of accumulations of drifting snow, redistribution of surface run-off and microclimatic effects, the fluctuations are greater within the belts than in the fields between, and by improving the distribution of snow in these fields the belts increase humidity and raise groundwater levels as against the open steppe, but the maxima and minima of wells in the centre of the forest belts over the observation period 1892–1957 do not reveal either a general rise or a general fall of levels, only long-term fluctuations under the influence of climate which are paralleled in the fields between the strips and in the open steppe itself. [Cf. *F.A.* 11 Nos. 295–6.]

1381. GRUDINSKAYA [GRUDINSKAJA], I. T., and SHPAK [ŠPAK], I. S. **Effect of forest and forest strips on the moisture conditions of soils and groundwater levels in the forest-steppe and steppe districts of the Ukraine.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (252–70). 17 refs. [E.e.f.]

Investigations in 1954–59 in Oak forests in the Black Forest (Kirovograd) region indicated that soil moisture, except in the first 50 cm. of the profile, was greater in the open than in the forest, where water contents exceeding field capacity only occurred in the upper layers. The groundwater level in the forest was 3–5 m. below that in the open and rose after recent fellings. Similar observations on groundwater tables in the Trostyanets forest range (Sumy region) in a Pine stand on sandy soil lent additional support to the theory of the desiccating effects of forests, while observations in the Veliko-Anadol region [cf. *F.A.* 11 No. 294] indicating that groundwater levels were higher under or near experimentally planted forest strips, are considered to prove the beneficial role of such strips in accumulating wind-blown snow and surface run-off from the fields. On the other hand, on the basis of an analysis of climatic data suggesting a close correlation of periodic groundwater fluctuations with the mean annual precipitation of the preceding decade, the general rise in groundwater levels in the area is attributed to meteorological factors and not, as done by Labunski, to the influence of the forest.

1382. NÄGELI, W. Versuche zum Problem des Oberflächenabflusses bei Wald- und Weideböden. **[Surface run-off tests on forest and pasture soils.]** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (140–9). 7 refs. [G.e.f.]

Describes preliminary tests with artificial precipitation carried out at various times on small 1-sq.m. plots on pasture or forest land in various places, particularly on the clayey, poorly permeable soils of the Schwarzsee hydrological station [cf. *F.A.* 20 No. 4096]. Though absolute values varied greatly, % of surface run-off (after wetting with 100 or 50 mm. water in 100 min.) and time required for the infiltration of a 100-mm. column of water (before and after the precipitation tests) were always much greater on the pasture plots. Sub-surface run-off (down to 50 cm. depth) was markedly greater in the forest, where it almost equalled surface run-off.

1383. BOCHKOV [BOČKOV], A. P. **The forest and the river run-off.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (174–81). 5 refs. [E.e.f.]

Presents and analyses Russian data (including the author's) showing for 40 river basins, each $\geqslant$ 1000 sq. km., a positive correlation between long-term mean annual flow and forest cover under conditions of similar mean annual precipitation. The difference (equated here with evapo-transpiration) between run-off and precipitation was linearly related to precipitation independently of cover, where it was $\leqslant$ 400–500 mm. p.a. Where annual precipitation was greater than this, there was a trend for each 10% increase of forest cover to reduce evapo-transpiration by 5, 3, or 2% according to whether precipitation for a given year was 600, 500, or 400 mm. respectively. The apparent contradiction between data from small catchments and whole river basins is attributed largely to sub-surface flow not being measured in the former, where river beds are shallow. [Cf. *F.A.* 20 No. 1394.]

1384. SOKOLOVSKY [SOKOLOVSKIJ], D. L. **On the effect of the forest on the regime of the river flow.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (199–211). 15 refs. [E.e.f.]

Discusses the problem on the basis of Russian and foreign data for annual and seasonal flow, run-off coefficients etc. from open and forested small catchment areas at the Valdai and Pridesyanskaya hydrological stations, and in Switzerland etc., on the one hand, and the seasonal and long-term variations of the larger Russian rivers [cf. preceding abstract] on the other, stressing in particular the equalizing influence of forests on seasonal fluctuations. The effects, if any, of deforestation on total annual flow are, however, considered to be so small, compared to annual variations caused by meteorological influences, that they could never be accurately determined.

1385. IDSON, P. F. F. **Methods of studying the dependence of river run-off on the forest coverage of its basin.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (290–301). [E.e.f.]

Discusses the merits of comparing stream flow from (*a*) catchments differing in cover but otherwise similar, over the same period, and (*b*) one catchment over successive periods after a change in forest cover, and the factors of geology, soil structure, topography and meteorology that have to be taken in account. Method (*b*) is considered promising for investigating surface run-off, as, by analysing run-off coefficients in areas where data on the economic use of the land after the forest has been felled are available, it is likely to yield information on the relative importance of changes in snow melt and soil permeability. The use of this method for analysing sub-surface run-off is thought to require long-term records (40–50 years). A method comparing sub-surface run-off data from a forested area with those from another area before and after changes in forest cover is suggested. Preliminary results of studies suggest that where annual flow is greater from well wooded than from less wooded river basins (and cases of greater autumn floods in the former have been recorded), this is not only or mainly due to greater sub-surface run-off, but to greater total precipitation in the forests, which is not recorded by the existing installations of rain and snow-measuring instruments.

1386. RODIER, J. Quelques données sur l'écoulement dans les forêts équatoriales. **[Some data on stream flow in equatorial forests.]** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (155–63). [F.f.]

Presents and discusses hydrological data mainly from 9 medium and large drainage basins in French Equatorial Africa ranging from 1000 to 200,000 sq. km. in area, and from 5 small catchments in the Ivory Coast and in the Middle Congo (5–50 sq. km.). The sharp decline in mean annual run-off for forested catchments when annual rainfall is <1600 mm. is attributed mainly to the effect of the vegetation, on the evidence of comparable data from a savanna basin with high rainfall in Dahomey and from experimental small catchments of varying vegetation. The vegetation's effect on the run-off coefficient is less marked than that on flood peaks, which, for similar slopes and soils, are about twice as high in large savanna basins and as much as 8–12 times as high in small savanna basins, as in the forest, under the impact of a downpour of 120 mm. Maximum run-off in the forest, on average slopes and soils of average permeability, is estimated at ca. 600 litres/sec./sq. km., whereas 3000–6000 litres are not uncommon in savanna country. The influence of soil permeability is relatively less important in the forest than in savanna. Slope has a marked effect on flood stream-flow for all gradients > 15–20%, though much less under forest than in savanna.

1387. BANKY, G. **Results of the operation of the erosion measuring station at Kisnana [Hungary] for the years 1956 to 1958.** *Publication, Association Internationale d'Hydrologie Scientifique, Gentbrugge* No. 48, 1959 (271–85). [E.g.f.]

Part I describes the topography, soils, climate etc., and instrumentation of the station, ca. 5 ha. situated at the southern foot of the Matra mountain (alt. 130–200 m.), divided into 7 sub-plots, of which one was derelict mixed forest, one Robinia, 2 scrub, 2 pasture, and one eroded to bedrock. Part II compares the effect of soil condition (dry, saturated, frozen), intensity of precipitation, etc. on run-off and erosion as a whole, and the effect of rains of varying intensity on the different sub-plots. The mean run-off from the forest section was 4% and the maximum (apart from snow melt) 20%, against 15 and 50% from the pasture and a mean run-off of 70% from the eroded area. Erosion was nil in the forest and negligible in the pastures, but very high in the eroded area. Future studies will include observations on erosion after clear felling of the forest, effects of grazing, and finally replanting 5 years after felling.

1388. MURAI, N. **[Fundamental studies on the slope soil erosion in source basins of Hokkaido]** *Res. Bull. Exp. For. Hokkaido Univ.* 19 (3), 1958 (1–98 + 112 photos). 70 refs. [Jap.jap.e.*e*.]

A fully documented account (45 graphs and diagrams, 36 tables, with English captions) of field studies carried out from 1950 to 1957, on characteristics and interrelations of slope soil erosion, surface run-off and infiltration on forested areas in 5 catchments. An outstanding finding was the great importance of depth of snow cover in winter for facilitating infiltration and reducing surface run-off and erosion in spring.

1389. KOHNKE, H., and BERTRAND, A. R. **Soil conservation.** McGraw-Hill Book Company, Inc., New York, Toronto, London. 1959. pp. vii + 298. Many refs. Price [£2. 12*s*. 6*d*.]

Contains sections on: soil conservation as a problem of humanity; the soil; soil erosion; aims and principles of soil conservation; methods; special problems; economics; farm planning for soil conservation; and the future of land management.

1390. DURHAM, L. J. **Indicators of land deterioration in Snowy Mountains catchments.** *J. Soil Conserv. Serv. N.S.W.* 15 (3; 4), 1959 (251–76; 333–63). 19 refs.

Describes some of the indicators of erosion caused by over-grazing, fire, etc. The effect of exclusion of grazing stock on the regeneration of fire-damaged Snow Gums (*Eucalyptus coriacea*) is also discussed with numerous photographs.

1391. MORLAND, R. T. **Erosion survey of the Hume catchment area [N.S.W.] Part IV. Vegetation. Part V. Land use and fire damage.** *J. Soil Conserv. Serv. N.S.W.* 15 (2; 3), 1959 (172–86; 208–26). 23 refs.

Part IV discusses the environmental factors governing the distribution of vegetation units, including the ecology of *Eucalyptus* species, and the secondary grassland types. Part V includes the utilization of the forests which cover more than half the area, by logging and grazing, the chief erosion factor in this respect being burning. Control of all fires, whether set or unintentional, is considered highly important. [Cf. *F.A.* 21 No. 43.]

1392. COSTIN, A. B., *et al.* **Studies in catchment hydrology in the Australian Alps. I. Trends in soils and vegetation.** *Technical Paper, Division of Plant Industry, Melbourne* No. 13, 1959. pp. 36 + 36 photos. 16 refs.

[Cf. *F.A.* 19 No. 1328.] Examines the nature of soil and vegetation 'trends,' as distinct from 'conditions', in Australia, with particular reference to subalpine woodlands, heaths, marshes, and wet sclerophyll forests (included because they are subject to similar land-use practices to those in the adjoining alpine and subalpine communities).

1393. **[Protective plantations round reservoirs.]** *Lesn. Hoz.* 11 (12), 1958 (25–31). [Russ.]

Three articles: The importance of afforestation round large reservoirs (*N. Ja. Emel'janov*) [to prevent erosion of the banks and silting up of the reservoirs formed as part of the hydro-electric schemes on the Volga, Kama, Dnieper, etc.]; Stands to protect the banks of the reservoir of the Novosibirsk Hydro-Electric Station (*L. A. Lamin*); and Choice of species for erosion-control plantations in the area of the Volga Hydro-Electric Stations (*V. K. Vetkasov*) [cuttings of *Salix acutifolia*, *Populus simonii*, *P. balsamifera* and 'Moscow' Poplar gave 95, 80, 71, and 45% rooting respectively. The first three species are recommended for these plantations.]

1394. FAJDIGA, D. Vegetativne melioracije v Belca. **[Controlling the Belca torrent by planting.]** *Gozd. Vestn.* 16 (2/3), 1958 (33–42). [Sloven.]

An account of measures taken, including terracing, and planting of trees, shrubs and grasses.

14. Systematic Zoology

145.7 Insecta. Entomology

See also Nos. 2038 *et seq.*, 2479 *et seq.*

1395. FRASER, F. C. **Handbooks for the identification of British insects. Vol. I. Parts 12 & 13. Mecoptera, Megatoptera, Neuroptera.** Royal Entomological Society of London. 1959. pp. 40. 46 refs. Price 10*s*. 6*d*.

1396. PERKINS, J. F. **Handbooks for the identification of British insects. Vol. VII. Part 2 (*ai*). Hymenoptera. Ichneumonidea. Ichneumonidae, key to subfamilies and Ichneumoninae—I.** Royal Entomological Society of London. 1959. pp. 116. Price £1. 5*s*.

1397. WELKE, C. Zur Kenntnis von *Strongylogaster xanthoceros* (Steph.) und *Strongylogaster lineata* (Christ.) und ihrer Parasiten. **[*S. xanthoceros* and *S. lineata* and their parasites.]** *Beitr. Ent.* 9 (3/4), 1959 (234–92). 53 refs. [G.g.e.russ.] O.H.

A description, based on field and laboratory observations, of morphology, life history and parasites of these tenthredinids, whose larvae live on bracken and overwinter in the outer bark of Pines, without, however, damaging any living tissue.

1398. CEBALLOS Y FERNÁNDEZ DE CÓRDOBA, G., and CEBALLOS JIMÉNEZ, P. Sección de entomología forestal. Las especies españolas del género *Leucospis*. **[Section for forest entomology. Spanish species of the genus *Leucospis*.]** *An. Inst. For. Invest. Exp. Madrid* 30 (3), 1958 (183–9). [Span.]

Presents brief descriptions of 5 Spanish species, with a key and notes of localities where found.

1399. MATHUR, R. N. **Pupa of *Elasmocylidrus tricolor* Corporaal (Cleridae, Coleoptera).** *Indian For.* 85 (11), 1959 (650–1). 3 refs.

E. tricolor is predaceous on several kinds of borer, particularly Bostrychidae. Its hosts, distribution, and pupal characters are covered.

1400. NUNBERG, M. Die Gattung *Xyleborus* Eichhoff (Coleoptera, Scolytidae). I. Teil. **[The genus *Xyleborus*. Part I.]** *Beitr. Ent.* 9 (3/4), 1959 (413–66). 32 refs. [G.g.e.russ.] O.H.

A revision of the genus *s.l.* with supplementary descriptions. The present part I describes and illustrates 64 species on the basis of material from the Entomological Institute, Berlin-Friedrichshagen.

1401. YOGO, S. **[On the ecological distribution of Scarabaeidae species.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 114, 1959 (33–52). 31 refs. [Jap.e.*e*.]

A study of the distribution in Japan of the various species (broadly speaking, *Anomala geniculata*, *Grandia albolineata* and *A. multistriata* in the coastal regions, and *A. rufocuprea* and *Serica orientalis* inland), with special reference to the possible relation between ecological distribution and the characteristic flying behaviour of each species.

15. Animal Ecology. Game and Fish Management, Hunting, Shooting and Fishing

See also section 451 and Nos. 2044, 2138–9, 2573.

1402. GRODZIŃSKI, W. Sukcesja zespołów drobnych ssaków na zarastającym zrębie i zsuwie górskim w Beskidzie Średnim (Karpaty Zachodnie). **[The succession of small mammals on a clear felling, later overgrown, and on a landslip in the Beskid Średni (W. Carpathians).]** *Ekologia Polska, Warszawa* 7 *A* (4), 1959 (83–143). 44 refs. [Pol. pol.e.*e*.] Price *Zl.* 16. O.R.S.

Presents trapping results for the period 1945–57 on an area of 5·6 ha. clear felled in 1944, and for 1949–57 on 2·9 ha. after a landslip in 1949, showing the relation between small-mammal populations and plant succession. Mammal density was low immediately after clear felling, increasing with colonization by light-demanding plant species, reaching a maximum in the bush and deciduous thicket stages, and decreasing again through coniferous thicket and pole stages.

1403. BULIN, I. Somogyi tapasztalatok az erdömüvelés és vadgazdalkodas összehangolásáról. **[Experiences in the co-ordination of silvicultural and forest-game interests.]** *Erdö* 8 (5), 1959 (185–9 + smries in suppl.). [Hu.russ.g.]

Stresses the advisability of unifying control of both interests so as to ensure the provision of adequate forage, notably *Rubus procerus*, *Salix cinerea* and various shrubs.

1404. GYSEL, L. W. **Effects of different methods of releasing Pine on wildlife food and cover.** *Down to Earth, Midland, Mich.* 13 (2), 1957 (2–3). A.P.B.

The environmental changes resulting from the release of Pines by various methods of eliminating overstorey Oak produced apparently ideal conditions for forest game, viz. low-growing browse and cover in the form of grasses, berry-producing shrubs and tree sprouts. Cutting and girdling proved suitable for producing large-scale browse; where sprays were used, food and cover on a smaller scale were maintained by leaving individual trees or strips unsprayed.

16. General Botany

See also No. 1464.

1405. MĪR DĀMĀDĪ, I. **[Forest botany.]** Forest Department, Teheran. 1958. pp. 12 + 189. 4 refs. [Per.]

Lectures to forestry students at the Forestry Department, Ministry of Agriculture.

1406. SASS, J. E. **Botanical microtechnique.** The Iowa State College Press, Ames, Iowa; Constable & Co., Orange St., London W.C.2. 3rd ed., 1958. pp. 228. 63 refs. O.R.E.

Covers the preparation of plant tissues for microscopic study, the use of the microscope and related equipment for the study and interpretation of the material, and the recording and illustration of the results. The microscopic treatment of woody species, fungi of importance in forestry, etc. is also dealt with. There is a subject index.

160. Plant Chemistry

See also Nos. 1429, 1431, 1437, 1501, 1538, 1540–2, 1569, 1771–2, 1813, 1935, 1984, 2333 *et seq.*, 2555 *et seq.*

1407. PLOUVIER, V. **Water-soluble free acidity in plants.** *Bulletin de la Société de Chimie Biologique, Paris* No. 41, 1959 (603–10). [F.] From *abstr.* in *Chem. Abstr.* 53 (19), 1959 (18196). P.R.

The free water-soluble acidity is high in chlorophyll-containing organs of most Pinaceae and Taxaceae, but slight in Cupressaceae. In very young or fully mature leaves, a maximum occurs, which decreases during the ageing of leaves or stem and during fruit lignification. Angiosperms showed less regularity in acidity than gymnosperms.

1408. TONANI, F. Ricerche sulla nutrizione minerale delle piante della regione borifera toscana. Dosaggio del boro in piante della regione borifera toscana. Metodo spettrografico. **[Research on the mineral nutrition of plants of the boriferous region of Tuscany. Spectrographic method of measuring the amounts of B present in plants.]** *Nuovo G. Bot. ital.* (*n.s.*) 64 (4), 1957 (1958), (641–51). [It.it.e.] A.P.B.

A spectrographic method, combined with the destruction of organic substances by combustion, permits simple determination of the B content of vegetable materials. The present paper gives the results of determinations on 43 herbaceous and shrub species and on *Quercus cerris* leaves.

1409. **Utilization of nitrogen and its compounds by plants.** *Symposia of the Society for Experimental Biology, Cambridge* No. 13, 1959. pp. vii + 385 + 5 plates. Many refs.

Comprises 20 papers presented at the University of Reading in Sept. 1958, on the use of N and N compounds by micro-organisms, algae, yeasts and other fungi, and higher plants. The following papers (mostly of a review nature, but containing some fresh data) include data on trees and shrubs: Fixation of nitrogen in non-legume root nodule plants (*G. Bond*; pp. 59–72 + 3 plates; 45 refs.) [cf. *F.A.* 20 No. 2928]; Interrelations of ornithine, citrulline and arginine in plants [especially *Pinus* spp.] (*A. W. Naylor*; pp. 193–209; 57 refs.) [cf. *F.A.* 21 No. 135]; The influence of certain environmental factors on the formation and accumulation of alkaloids in plants (*V. S. Sokolov*; pp. 230–57; 50 refs.) [reviews Russian research]; and Urease, urea and ureides in plants (*E. G. Bollard*; pp. 304–29; 134 refs.)

1410. BARNES, R. L. **Formation of allantoin and allantoic acid from adenine in leaves of *Acer saccharinum* L.** *Nature, Lond.* 184 (4703), 1959 (1944). 4 refs.

1411. CAMBIE, R. C. **The extractives of *Dysoxylum spectabile*, Hook.** *J. chem. Soc.* Jan., 1959 (468–9). 6 refs. O.R.S.

Ether extraction of the bark gave a non-phenolic oil; ether gave a negligible extract from heartwood. Alcoholic extracts of both bark and heartwood were mainly composed of condensed tannins; paper chromatography showed the presence of a further phenolic compound, identified as (+)-catechin in the heartwood but not the bark. Flavonoids, anthocyanins, leucoanthocyanins and alkaloids were absent from bark and heartwood extracts.

1412. Briggs, L. H., and Cambie, R. C. **The constituents of *Phebalium nudum* Hook. I. The bark.** *Tetrahedron, Lond.* 2 (3/4), 1958 (256–70). 15 refs. [E.e.] O.R.S.

Analysis gave 21 constituents, 17 of which could be identified. Two new substances of the coumarin type have been named phebalin and phebalarin. Two others were aliphatic. The presence of at least 10 more phenolic substances was shown by paper chromatography.

1413. Cambie, R. C. **The constituents of *Phebalium nudum* Hook. Part 2. Alkaloids of the wood.** *N.Z. J. Sci.* 2 (2), 1958 (254–6). 2 refs.

The furoquinoline alkaloids, dictamnine, skimmianine, and kokusaginine have been identified in the wood and isolated as their picrates. Citral and ellagic acid have also been isolated.

1414. Plouvier, V. Sur la recherche des acides quinique et shikimique chez quelques Gymnospermes. **[Quinic acid and shikimic acid in some gymnosperms.]** *C.R. Acad. Sci., Paris* 249 (16), 1959 (1563–5). 3 refs. [F.f.] O.R.S.

Of the 37 species studied, 26 (all Pinaceae or Taxodiaceae) contained quinic acid in the leaves, especially of young shoots, and 7 (all Pinaceae) in the cones; 20 (*Ginkgo biloba*, *Podocarpus purdieanus*, *Sequoïa sempervirens*, *Cryptomeria japonica* and 16 Pinaceae) contained shikimic acid in the leaves, mainly of older shoots, and 8 (*Cedrus atlantica*, *C. japonica* and 6 *Pinus* spp.) in the cones. The acids were not found in the leaves of *Torreya nucifera*, *Taxus baccata*, *Picea asperata*, *P. mariana*, *Cupressus arizonica* and *Juniperus communis*, but were probably present in amounts too small for detection.

1415. Bates-Smith, E. C., and Whitmore, T. C. **Chemistry and taxonomy in the Dipterocarpaceae.** *Nature, Lond.* 184 (4689), 1959 (795–6). 7 refs.

A chromatographic examination was made of the hydrolysates of the leaves of 28 Malayan dipterocarps (results tabulated). On the basis of the abundance and type of leuco-anthocyanins present, the following grouping is suggested: *Dipterocarpus* with *Dryobalanops*; *Shorea* with *Hopea* and *Balanocarpus*; *Vatica* rather closer to *Shorea* than to *Hopea*; *Anisoptera* and *Upuna* uncertain. The groups of *Shorea* are not very distinct. *Balanocarpus heimii* should probably be included in *Hopea* on floral and wood characters, and the same conclusion is now reached from chemistry.

1416. Ganguly, A. K., and Seshadri, T. R. **Isolation of the more commonly occurring leucoanthocyanidins of plants.** *J. sci. industr. Res. India* 17*B* (4), 1958 (168). 4 refs. P.O.

The sources of some leucoanthocyanidins studied are tabulated. They are leucopelargonidin from gum of *Eucalyptus calophylla*, leucocyanidin from gum of *Butea frondosa*, and leucodelphinidin from bark of *Cleistanthus collinus* and gum of *Eucalyptus pilularis*. [Cf. *F.A.* 21 No. 70.]

1417. Damanski, A. F., and Pazarincevic, F. **Chemical composition of the catkins of Walnut trees.** *Bulletin de la Société de Chimie Biologique, Paris* No. 41, 1959 (611–9), [F. ?] From *abstr.* in *Chem. Abstr.* 53 (19), 1959 (18196). P.R.

During the growth period, reductone content is higher than total content of ascorbic and dehydroascorbic acids, the maximum content of reductones and reducing substances being found during the initial stage (i.s.) of bud formation. In this stage and the i.s. of catkin formation, only free reducing sugars are found. The highest production of pentosans was also found in the i.s. of bud formation, as well as in the stage of physiological ripening (withering) of the catkins when the highly reducing substances disappear completely. In the i.s. (i.e. ca. 3 weeks) of the growth period, dry matter of buds consists almost exclusively of strong reducing substances containing enediol groups; that of ripe catkins no longer contains such substances, but contains macromolecular polyholosides. The N-containing substances were not studied.

1418. Virtanen, A. I., and Gmelin, R. **On the structure of 4-hydroxypipecolic acid isolated from green plants.** *Acta chem. scand.* 13 (6), 1959 (1244–6). 7 refs. [E.] O.R.S.

The acid, isolated from the seeds of *Acacia willardiana* and *Lysiloma bahamense*, was previously found in *A. pentadena* and *Albizzia lophantha*. Its structure has been determined.

1419. Gmelin, R. Isolierung von 2 neuen pflanzlichen Aminosäuren: *S* (β-Carboxyäthyl)-*L*-cystein und Albizzin aus den Samen von *Albizzia julibrissin* Durazz. (Mimosaceae). **[Isolation of two new plant amino acids: *S* (β-carboxyethyl)-*l*-cystein and albizzin from seeds of *A. julibrissin*.]** *Zeitschrift für Naturforschung, Tübingen* 13 *B* (4), 1958 (252–6). 9 refs. [G.g.] O.R.S.

1420. Barua, A. K., and Raman, S. P. **Triterpenoids. X. The constitution of albigenic acid—a new triterpenoid sapogenin from [the beans of] *Albizzia lebbek* Benth.** *Tetrahedron, Lond.* 7 (1/2), 1959 (19–23). 13 refs. [E.e.] O.R.S.

161. Physiology

See also Nos. 1317, 1409, 1417, 1444, 1448, 1476, 1528 *et seq.*, 1688–9, 1732, 1911–2, 2007, 2010–2, 2119, 2290, 2342.

1421. Vité, J. P. **Observations on the movement of injected dyes in *Pinus ponderosa* and *Abies concolor*.** *Contr. Boyce Thompson Inst.* 20 (1), 1959 (7–26). 45 refs.

Acid fuchsin and other dyes in aqueous or alcoholic solution were introduced into the water-conducting layers of *Pinus ponderosa* and *Abies concolor* by different methods of bole injection. The trees were then cut into logs, and disks removed at different heights to determine the pathway taken by the dye. The dye was found to ascend along tracheidal conduits that follow the slope of grain in the sapwood. The structure in which these conduits are arranged is basically the same in both species. The conduits deviated to the left of the tree axis and changed continuously to the opposite side in each subsequent growth ring. Accordingly, dye injected radially through a hole bored in the lower bole produced a typical spiral pattern as observed in transverse sections in the upper bole. This also resulted in supplying most branches of the tree with dye in an inner or outer growth ring or in several growth rings. Besides continuous changes in the deviation of the tracheidal conduits according to age, sudden changes in angle and direction were produced by varying environmental conditions involving the width of the annual growth rings. Heavy pruning and releasing of suppressed trees were found to have similar effects. The results of dye injections confirmed the recent concept of several wood technologists that a varying slope of grain is the rule rather than the exception in conifers. Furthermore, the experiments indicated an arrangement of the tracheidal conduits that led to the conclusion that in the tree species investigated not only the transport but also the distribution of the transpiration stream over the whole transpiration surface is accomplished by the sapwood. *From author's summary.*

1422. VITÉ, J. P., and RUDINSKY, J. A. **The water conducting systems in conifers and their importance in the distribution of trunk-injected chemicals.** *Contr. Boyce Thompson Inst.* 20 (1), 1959 (27–38). 4 refs.

The routes by which water is conducted upwards in conifers were studied by injecting acid fuchsin near the base of young to middle-aged trees belonging to 23 species from 12 genera and 4 families. A few days after injection, the trees were felled and sectioned to see whether the dye solution had moved directly upward or deviated from the axis of the tree in the several growth rings where it had been incorporated. Five different patterns of translocation were detected in the sapwood of the conifers examined. These, and the way they effect distribution of the injected materials, are described. *Type A.* The spiral ascent, turning right, is characteristic of the investigated species of *Abies*, *Larix*, *Picea* and subgenus *Diploxylon* of *Pinus*. As seen in the transverse sections, the fuchsin-dyed strip, which at the place of injection cuts radially across the sapwood, becomes in the higher transverse surfaces a spiral band. The spiral runs from the outermost growth ring clockwise toward the centre of the stem. *Type B.* The spiral ascent, turning left, possessed by *Pinus monticola* and *P. lambertiana*, shows the same system as type A, but in a reversed direction. *Type C.* The interlocked ascent is found in *Sequoia*, *Libocedrus* and *Juniperus*. The dyed radial strip at the place of injection changes into a zigzag pattern that extends over the transverse surface of the stem as the distance increases from the point of injection. *Type D.* The sectorial, winding ascent appears in *Tsuga* and *Pseudotsuga*. The dye ascends in the same sector along the entire stem, although the sector winds round the stem axis. *Type E.* The sectorial, straight ascent, in *Thuja* and *Chamaecyparis*, translocates the dye almost straight up from the point of injection. The differences in the water-conducting systems usually exist between families or genera, but in one instance also within a genus (*Pinus*). Finally some observations are given of specific variations within these systems shown by some characteristics of the conifers studied. *From authors' summary.*

1423. RUDINSKY, J. A., and VITÉ, J. P. **Certain ecological and phylogenetic aspects of the pattern of water conduction in conifers.** *For. Sci.* 5 (3), 1959 (259–66). 11 refs. [Cf. preceding abstracts.]

1424. SATOO, T. **Estimation on amount of water loss by transpiration of coniferous forest.** *Kagaku* No. 28, 1958 (205). [Jap.?] From *abstr.* in *Rec. Res. Fac. Agric. Univ. Tokyo* No. 8, 1957/58 (69). [E.]

Estimates and compares the amounts of water transpired by pure stands of *Cryptomeria japonica*, *Chamaecyparis obtusa*, and *Pinus densiflora*. The weights of needles (green) were 36·5, 30 and 12 tons/ha., and amounts transpired 1230, 970 and 680 mm./year/ha. respectively.

1425. JOHNSTON, R. D. **Control of water movement by stem chilling.** *Aust. J. Bot.* 7 (2), 1959 (97–108 + 2 plates). 21 refs. O.B.D.

A portion of the stem of a small potted *Pinus radiata* tree was maintained at a near-freezing temperature, while the transpiration of the upper part of the plant was measured. The freezing point of the stem was ca. − 2° C., and so long as stem temperature was kept above this point, transpiration continued normally. Freezing the stem resulted in decreased transpiration after a short time interval, and within 3 hours transpiration was almost undetectable. When the stem temperature was maintained at just below the freezing point for 7 days, the leaf water deficit of the shoot rose from 10 to 47%, but, after freezing was stopped, the normal values returned. The plant showed no sign of damage due to freezing. Field trials, using solid CO_2 as a refrigerant, showed that growth was reduced considerably on a branch chilled to − 4° for 7 days, but needles remained alive and appeared healthy. Lower temperatures caused damage to needles and twigs. *From author's summary.*

1426. MILLER, R. Assimilationsuntersuchungen an Tannen und Fichten einer Naturverjüngung im Bayerischen Wald. **[Investigations on the assimilation of Silver Fir and Spruce natural regeneration in the Bayerische Wald.]** *Forstwiss. Cbl.* 78 (9/10), 1959 (297–317). 43 refs. [G.g.]

The investigations were made on healthy needles (mainly 1-year-old) of 5- to 20-year-old Spruce and Fir, at heights of 30 to 200 cm. above the ground, both in the stand, and in open country outside it, in Sept./Oct. 1953. The logarithmic curve of net assimilation in relation to light at first rises more steeply for Fir than for Spruce, i.e. Fir is superior to Spruce in assimilation in the morning and evening, and in overcast weather, while in bright light, especially in the open, the differences disappear. The assimilation capacity of both species is well suited to the mean light intensity of the site. There is a greater difference in the curves of light dependence between trees of both species grown inside and outside the stand than between the species themselves. In laboratory experiments, patches of light of short duration (simulating understorey conditions) were shown to cause an increase in assimilation lasting longer than the period of illumination, presumably because they stimulate a widening of the stomatal openings. At constant light intensities, assimilation increases with relative humidity, which is also a result of (hydroactive) stomatal movements. A positive CO_2 balance is possible in both species at temperatures of ca. 0° C. Assimilation in Fir increases with temperature up to $> 20°$, while in Spruce it scarcely increases, and may even decrease, at 10–20°.

1427. TRANQUILLINI, W. Die Stoffproduktion der Zirbe (*Pinus cembra* L.) an der Waldgrenze während eines Jahres. I. Standortsklima und CO_2-Assimilation. II. CO_2 Zuwachs und CO_2 Bilanz. **[Production of plant material by *P. cembra* at the forest limit throughout one year. I. Microclimate and CO_2 assimilation. II. Growth and CO_2 régime.]** *Planta* 54 (2), 1959 (107–51). 29 + 29 refs. [G.g.] O.B.D.

(I) Net CO_2 assimilation was measured on the whole of the aerial portion of 6 young trees on the same aspect on 101 days during the growing period (181 days), and was correlated with microclimatic data. When the trees thaw out (in May) assimilation begins immediately, but production of plant material is low until leaf temperature at mid-day rises above 10° C. A period of high production ensues, lasting until shoot formation. The weather on individual days has a noticeable effect on the daily total of assimilation when (1) late frosts or snow occur, (2) temperature rises above the optimum (i.e. mean temperature between 5 a.m. and 7 p.m. $> 25°$ C.), or (3) the ground dries out. Trees that thaw out late miss the period of high production. With shoot formation, production becomes consistently low; the reason is not clear, but has no connexion with climate. In autumn, light conditions and late frost increasingly limit assimilation, so that it ceases long before the tree is snowed up. The high spring assimilation rate shows that the slow growth of young *P. cembra* at the forest limit is not related specifically to a low assimilation capacity. Yearly totals of CO_2 uptake are also kept low through the decrease in production during high summer and, most of all, through the shortness of the growing season. [Cf. *F.A.* 19 No. 1352; 21 No. 1317.]

(II) The following data were collected from *P. cembra* at Obergurgl (2000 m. alt.). In young plants dry weight increases, at the most, by 60% in one year. With rising age this increase falls off, and between 25 and 50 years amounts to only 10%. The falling off has three principal causes. (1) The trees shed yearly a proportion of old needles; the loss in material amounts to 8–15% up to the 25th year, but later rises to 30%. The weight increase therefore lags progressively behind the production of plant material. (2) The plant forms first of all as many assimilatory organs as possible. As it becomes older, growth of roots and stem plays an increasingly important part. (3) Assimilatory capacity of the leaves rises up to the age of 25 years. In the third decade it sinks because, as the crown becomes denser, light penetrates less readily to the leaves. Weight increase is small compared with other conifers at lower altitudes, although the seedling is vigorous and, in relation to its total weight, puts on more leaves than any other species. Of the yearly total assimilation (7830 mg. CO_2/g. of needles) in 5- to 8-year-old trees, 19·8% was given off by respiration of the aerial parts by day and 7·1% by night, the roots giving off another 5·7%. Under snow, which covers them for half the year, the trees lose another 5·6% or $\frac{1}{8}$ of their total dry weight. Total loss through respiration therefore amounts to 38·2% of the total assimilation. With the amount of CO_2 remaining to the plant during the course of the year it could form ca. 2·2 g. dry weight of plant material per g. of leaf, but in fact the trees investigated formed only 0·65 g. This discrepancy may be due in part to young plants giving off considerable amounts of CO_2 through the associated mycorrhizae.

1428. VERDUIN, J. **Photosynthesis in conifers computed per unit leaf area, dry weight, volume, chlorophyll content and respiratory rate.** *Ecology* 40 (4), 1959 (738). 4 refs.

A comparison of the photosynthetic rates of *Picea abies* and *Pyrus malus* in relation to the various factors enumerated in the title, showed that the latter had much higher rates—e.g. rate per mg. dry weight of foliage (in micromols CO_2 absorbed per hr.) 1 vs. 0·1 for Spruce. [Cf. *F.A.* 20 No. 4138.]

1429. PEEL, A. J., and WEATHERLEY, P. E. **Composition of sieve-tube sap [of *Salix viminalis*].** *Nature, Lond.* 184 (4703), 1959 (1955–6). 9 refs.

Concentration of solutes in the sap varied with season, e.g. sucrose concentration was 25% from Oct. to March, but only 4–6% in summer. An unexpected finding was 2% wt./vol. of K in the form of salts of citric and tartaric acids.

1430. GIRNIK, D. V. O processe nektaroobrazovanija u lipy. **[The process of nectar formation in Lime.]** *Pčelovodstvo, Vjatka* 35 (7), 1958 (37–40). [Russ.] From *abstr.* in *Biol. Abstr.* 34 (1), 1959 (No. 2567).

By cutting the bark of some branches to isolate them from the rest of the tree, and either removing the leaves, covering them with light-proof material, cutting off half the leaf, or leaving the leaves intact, and using C^{14}, the role of photosynthesis in the formation of nectar was studied. Analysis of nectar gave a very close correlation between nectar production and the photosynthesis that takes place in the leaves at the period of flowering. The results suggest that, under favourable conditions, the basic materials for the production of nectar in Lime are produced by the photosynthesis in the leaves of the same branch.

1431. LISICYN, D. I. Dinamika soderžanija uglevodov i žirov pri sozrevanii i prorastanii semjan jasenja. **[The dynamics of the carbohydrates and**

fats content of Ash seeds during ripening and germination.] *Biohimija* 24 (5), 1959 (850–4). 7 refs. [Russ.russ.e.] E.M.B.

Samples of *Fraxinus excelsior* seed were taken from 11 Aug. onwards and stored until Dec. under cold, dry conditions. From 29 Dec. to 24 March the seed was stratified in wet sand at 20° C., and from then till 3 June in a cellar at 0–2°. The seeds were then kept on moist filter paper at 20°. The contents of water-soluble carbohydrates (six fractions) and of crude fat were determined at intervals during this treatment and the results are tabulated for the seeds, and also for the radicle and cotyledons of the young seedlings, some of which were kept in the dark and others in the light. During ripening and stratification, there were no marked changes in the ratio of water-soluble carbohydrates and fats. In the later stages of germination the fat content fell considerably, the contents of sucrose, fructosides and glucosides (readily and not readily hydrolysable fractions) decreased, and the total monosaccharides increased. The evidence suggests that in germinating Ash seeds, utilization of the fats is preceded by their transformation into carbohydrates.

1432. WAREING, P. F. **Problems of juvenility and flowering in trees**. *J. Linn. Soc.* (*Bot.*) 56 (366), 1959 (282–9). 21 refs.

A discussion based on world literature.

1433. FRASER, D. A. **Growth mechanisms in hardwoods**. *Tappi* 42 (8), 1959 (634–41). 52 refs. P.R.

Describes the annual variations in radial growth of *Betula lutea* on three soil-moisture sites, based on a review of the literature and on observations during 10 years of research at Chalk River. Cambial activity of all the trees studied ceased by early September, even on sites where neither moisture nor soil was a limiting factor, and growth cessation seemed to be regulated by a shortened photoperiod acting through a growth-regulator mechanism. The continued production of early wood, when IAA is applied in late summer, indicates the 'hormonal' nature of the control of radial growth. Apical and radial growth may be prolonged and influenced by long photoperiods, certain temperature regimes, growth regulators applied externally, and optimum nutrient solutions. The mechanism of cellular differentiation of woody tissues is also discussed.

1434. BROWN, C. L., and WETMORE, R. H. **Auxin transport in the long shoots of Pine**. *Amer. J. Bot.* 46 (8), 1959 (586–90). 21 refs. O.B.D.

Presents data showing that endogenous auxin in the stem segments of Pine is actively transported under extremely low O tension and in amounts equal to that in normally aerated controls. In contrast, stem segments, previously evacuated of endogenous auxin, that readily transport IAA applied in donor blocks at physiological concentrations in air, do not do so in an atmosphere of pure N. It is concluded that it is the initial phase, the uptake of IAA from the block into the tissue, that is limiting at low O tension, while the second phase, the transport *sensu stricto*, is almost independent of O. *From authors' summary.*

1435. HATCHER, E. S. J. **Auxin relations of the woody shoot. The distribution of diffusible auxin in shoots of Apple and Plum rootstock varieties.** *Ann. Bot., Lond.* (*n.s.*) 23 (9), 1959 (409–23). 16 refs. O.R.E.

Free auxin content of the shoot apex was consistently less than that of the internodes below. The reappearance in mature internodes of free auxin, which has not been transmitted from the stem apex, implies either derivation from a stored state, or the ability of the internode to produce its own auxin.

1436. ALLARY, S. Substances de croissance et dormance des bourgeons de *Quercus pedunculata* Ehrh. **[Growth and dormancy substances in the buds of *Q. robur*.]** *C. R. Acad. Sci., Paris* 249 (16), 1959 (1557–9). 7 refs. [F.f.] O.R.S.

A neutral and an acid inhibitor were present in dormant buds from September to January; a stimulator appeared in October and persisted till January. The stimulator and the neutral, but not the acid inhibitor were found in buds treated with ethylene chlorohydrin.

1437. SHARMA, A. **Tumour production in plants by plant extracts.** *Nature, Lond.* 184 (4692), 1959 (1083–4). 2 refs.

Bark extracts of *Alstonia scholaris* applied to root tissues of *Allium cepa* induced tumours and polyploidy.

1438. GIORDANO, E. L'azione delle gibberelline sulle piante forestali. **[The action of gibberellins on forest plants.]** *Cellulosa e Carta* 10 (10), 1959 (7–9). 17 refs. [It.f.e.g.]

Briefly reviews literature on the subject.

1439. ANIKEEVA, I. D., and MININA, E. G. O žiznedejatel′nosti konusa narastanija u drevesnyh porod v svjazi s seksualizaciej pobegov. **[The activity of the apical meristem in woody species in relation to the sexual specialization of flower shoots.]** *Bot. Ž.* 44 (7), 1959 (907–15). 7 refs. [Russ.russ.e.]

Picea abies has eight types of shoot: (1) vegetative (v), (2) ♂, (3) v/♂, (4) ♀, (5) v/♀, (6) ♂/♀, (7) v/♂/♀, and (8) 'blind', i.e. having buds which, for various reasons, do not open, sometimes for some years. The lower and middle crown and 4th- and 3rd-order branches have a strong tendency to bear ♂ shoots, and the upper crown and lower-order branches to bear ♀ shoots. The initiation and growth of new organs in buds of ♀ shoots is more rapid than in those of ♂ shoots. Long before the sex rudiments are formed, the meristematic tissues have certain properties that determine the sex of the future shoot, causing greater activity in the growing point of ♀ shoots and being probably connected with the formation and accumulation of amphoteric substances, in differing quantities in the ♂ and ♀ shoots. The isoelectric point of the apical meristem occurs at a lower pH value in ♀ than in ♂ shoots, and falls in both towards the end of the growing season.

1440. SCARAMUZZI, F. Il ciclo riproduttivo di *Pistacia lentiscus* L. **[The reproductive cycle of *P. lentiscus*.]** *Nuovo G. bot. ital.* (*n.s.*) 64 (1/2), 1957 (198–213). 16 refs. [It.it.e.] A.P.B.

P. lentiscus is a dioecious species showing initial hermaphroditism in the ♂ flowers. The annual flowering cycle is discussed in detail.

1441. Kientzler, L. Cas d'hermaphrodisme chez le châtaignier. **[Hermaphroditism in Chestnut.]** *Bull. Soc. Bot. France* 106 (5/6), 1959 (211–2). 6 refs. [F.] O.B.D.

Reports the discovery of numerous ☿ flowers on *Castanea sativa* in the region of Annecy.

1442. Krjučkov, V. V. O temperature derev'ev. **[The temperature of trees.]** *Bot. Ž.* 44 (9), 1959 (1299–303). 7 refs. [Russ.]

[Cf. *F.A.* 17 No. 1221; 20 No. 1597.] Readings were made every 2 hours of the temperatures of a Birch 20 cm. in diam., and two Spruces, one 20 and one 60 cm. in diam., growing at 470 m. alt. on a south-facing slope, by means of mercury thermometers inserted to a depth of 4 cm. in holes drilled into the N. and S. sides of the trees at breast height. Data on the cloud cover, and air and stem temperatures are tabulated in detail for some of the days, and the results are discussed. On the whole, temperatures in Spruce stems were higher than those in the Birch, and the S. side of the trees was warmer than the N.

163. Embryology

See also No. 1460.

1443. Favre-Duchartre, M. ***Ginkgo*, an oviparous plant.** *Phytomorphology* 8 (3/4), 1958 (377–90). 15 refs. O.B.D.

In *Ginkgo* the accumulation of starch, lipidic and lipoprotein reserves within the ♀ prothallus, the massive elaboration of lipoprotein yolk in the archegonia, and the lignification of the integument, take place before fertilization and are independent of it. Ovules severed from the mother plant before fertilization are capable of subsequent embryonic development. The systematic implications of these phenomena are discussed. *From author's summary.*

1444. Camefort, H. Structure des filaments de chromatine du noyau de l'oosphère chez le *Pinus laricio* Poir. (var. *austriaca*). Étude en microscopie électronique. **[Structure of the chromatin filaments of the nucleus of the oosphere of *P. nigra* var. *austriaca*. Electron microscope study.]** *C.R. Acad. Sci., Paris* 249 (18), 1959 (1790–2 + 2 plates). 2 refs. [F.f.] O.R.S.

The filaments appear to consist of membranes lying in the lengthwise direction of the filament and forming a honeycomb structure.

1445. Konar, R. N., and Ramchandani, S. **The morphology and embryology of *Pinus wallichiana* Jack.** *Phytomorphology* 8 (3/4), 1958 (328–46). 17 refs. O.B.D.

1446. Ram, M. **Morphological and embryological studies in the family Santalaceae. II. *Exocarpus*, with a discussion on its systematic position.** *Phytomorphology* 9 (1), 1959 (4–19). 14 refs. O.B.D.

1447. Bhatnagar, S. P. **Some observations on the post-fertilization development of the embryo sac of *Santalum*.** *Phytomorphology* 9 (1), 1959 (87–91). 10 refs. O.B.D.

164. Morphology

See also Nos. 1439, 1445–6, 1496–7, 1507, 1616.

1448. Chouinard, L. I. Structure et fonctionnement de l'apex caulinaire de *Pinus banksiana* Lamb. au cours de la germination. II. Sur l'existence d'un centre quiescent au niveau de l'apex radiculaire juvénile de *Pinus banksiana* Lamb. **[I. Structure and functioning of the shoot apex in *P. banksiana* during germination. II. On the existence of a quiescent centre in the root apical meristem of *P. banksiana*.]** *Contr. Fonds Rech. For. Univ. Laval* No. 4, 1959. pp. 32. 29 refs. [F.f.e.]

1449. Aytuğ, B. *Abies equi-trojani* Ascher. Sinten'e ait bazı morfolojik yeni tesbitler. **[Some morphological discoveries in *A. nordmanniana* var. *equi-trojani*.]** *Istanbul Ünív. Orm. Fak. Derg.* 8*A* (2), 1958 (211–6). 5 refs. [Turk.F.]

Describes and illustrates material where in some cases all four buds or shoots of a whorl lie in the same horizontal plane. In other cases, and in all other native and exotic *Abies* species, three of the four buds or shoots are in the same horizontal plane, and the other one is lower. Research to confirm the hereditary nature of the phenomenon is in progress.

1450. Tomasello, D. Osservazioni sulla morfologia di un giovane pollone di *Eucalyptus globulus*. **[The morphology of a young *E. globulus* sapling.]** *Nuovo G. bot. ital.* (*n.s.*) 64 (4), 1957 (1958), (723–5). [It.it.e.] A.P.B.

A detailed study of the branches of a 3-year-old tree, with a scale plan. A distinction is made between leaf-bearing branches, whose function is purely alimentary and which do not elongate much, and the bud-bearing branches which elongate rapidly and will grow into the permanent big branches of the adult tree.

1451. Tasaico, H. La fisionomía de las hojas de árboles en algunas formaciones tropicales. **[The physiognomy of leaves from some tropical forest formations.]** Instituto Interamericano de Ciencias Agrícolas Turrialba, Costa Rica. 1959. pp. 86 + 1 map. 29 refs. [Span.span.e.]

Measurements were made on 12,000 leaves from 6 natural forest formations in Costa Rica classified according to Holdridge [cf. *F.A.* 10 No. 934] as: (1) montane belt—wet forest; (2) lower montane belt—moist forest, wet forest and rain forest; (3) subtropical belt—wet forest; and (4) tropical belt—wet forest. The results indicate that: (*a*) width and length of leaves increase with increasing temperature and decrease with increasing altitude. Temperature appears to be the factor most closely correlated with leaf dimension; with increasing altitude and decreasing temperature, trees had shorter, narrower leaves, independently of the amount of rainfall. (*b*) The greatest variety of species was found in formations with the highest temperature and lowest altitude. (*c*) In the formations studied, the mean length of leaves increased at a rate of ca. 0·5 cm.

per 100 m. drop in altitude. (*d*) The length/width ratio of the average leaf was fairly constant in all formations studied. (*e*) The mean length of leaves in the three formations of (2) was similar. The few exceptions were probably related to differences in elevation and temperature in these three places; greater rainfall increased the length of the apex. (*f*) Length of apex was closely related to length of blade in all formations. (*g*) The proportion of simple to compound leaves was similar in all formations. (*h*) The proportion of leaves without entire margins and of leathery texture was highest in (1) and lowest in (4). (*i*) The proportion of leaves without entire margins approximated to that of leaves of leathery texture in all formations. *From author's summary.*

1452. ARNOTT, H. J. **Vein anastomoses in the leaves of long shoots of *Ginkgo biloba*.** *Nature, Lond.* 184 (4695), 1959 (1336–7). 4 refs.

1453. WU, M. C.-Y. **The anatomical study of Bamboo leaves.** *Quart. J. Taiwan Mus.* 11 (3/4), 1958 (349–70 + 27 photos). 19 refs. [E.e.]

Describes and illustrates with photomicrographs the leaf structure of 10 species, one from Florida, the rest from Taiwan. Distinguishing features include shape, arrangement etc. of different types of cell, hair types, vein spacing, and size of vascular bundles.

1454. HANSEN, H. C. Der Einfluss des Lichtes auf die Bildung von Licht- und Schattenblättern der Buche, *Fagus silvatica*. [**The effect of light on the formation of light and shade leaves of *F. sylvatica*.**] *Physiol. Plant., Copenhagen* 12 (3), 1959 (545–50). 3 refs. [G.e.]

Experiments in the laboratory and *in situ*, in which light and shade buds were made to unfold under different light intensities, indicated that, while size, thickness and the structure of epidermis and vascular bundles are determined by the light intensity reigning at bud formation, the structure of the mesophyll develops during unfolding and is influenced by the light intensity at that period. In particular, leaves from shade buds unfolding in full daylight had a palisade tissue with longer and more densely placed cells than leaves from light buds developing in deep shade.

1455. DUNCAN, W. H. **Leaf variation in *Liquidambar styraciflua* L.** *Castanea* 24 (3), 1959 (99–111). 5 refs.

Analyses statistically the results of a small-scale but detailed biometrical study of leaves from different parts of a single tree, comparing them with similar results for a collection of one large shade leaf from each of 20 trees, as a preliminary to a possible study of mass collections. The material was collected near Athens, Ga. Suggestions are made on characteristics worth further study.

1456. NEČAEV, A. P. Nekotorye osobennosti morfologičeskogo stroenija list'ev barhata amurskogo (*Phellodendron amurense*). [**Some features of leaf morphology in *P. amurense*.**] *Bot. Ž.* 44 (6), 1959 (824–30). 4 refs. [Russ.]

Gives the results of a study made on seedlings and older plants (various types of shoot were included), with discussion of their significance as regards ontogeny and phylogeny. It is concluded *inter alia* that this species should be treated in early youth as a shade-bearer and later as a light-demander.

1457. MANŽOS, A. M. Tipy poček listvennicy sibirskoj i ih fenologia. [**Types of bud in *Larix sibirica*, and their phenology.**] *Bot. Ž.* 44 (8), 1959 (1148–54). [Russ.]

Distinguishes ♂ and ♀ buds and three types of vegetative bud giving rise to the several types of shoot (excluding dormant buds) in this species, and determines their relative frequency on 1-, 2-, 3- and 4-year-old branches of trees grown near Moscow. Dates of stages in flushing and flowering were recorded for 3 years (1951–53) near Moscow and correlated with air temperatures in April. The phenology of the different types of bud is compared. [Cf. *F.A.* 21 No. 1472.]

1458. STACHURSKA, A. Morfologia pyłku *Pterocarya hupehensis* Skan. [**The morphology of pollen grains of *P. hupehensis*.**] *Acta Soc. Bot. Polon.* 28 (2), 1959 (315–7 + 1 plate). 14 refs. [Pol.e.] O.B.D.

1459. CARR, D. J., and CARR, S. G. M. **Developmental morphology of the floral organs of *Eucalyptus*. I. The inflorescence.** *Aust. J. Bot.* 7 (2), 1959 (109–41 + 8 plates). 19 refs. O.B.D.

[Cf. *F.A.* 21 No. 1507.] The nature and structure of the inflorescence of *Eucalyptus* spp. is re-defined in the light of an analysis of the unit inflorescence, its development, mode of branching, bract systems, and the grouping of unit inflorescences into compound ones. The structure is elucidated of the unit inflorescence in 80 representative species, and a systematic notation for expressing the numbers and arrangement of the involucral bracts in dichasial inflorescences proposed. *From authors' summary.*

1460. ZUCCONI, L. Organogenesi del fiore ed embriologia in *Eucalyptus camaldulensis* Dehn. [**Floral organogenesis and embryology in *E. rostrata*.**] *Pubbl. Cent. Sper. Agric. For., Roma* 2, 1958 (1959), (59–86 + 5 plates). 18 refs. [It.it.e.*e*.]

1461. GRIFFITH, A. L., and HOWLAND, P. **Silvicultural research. III. Research on softwoods. *A*. Seed problems.** *Extr.* from *Rep. E. Afr. Agric. For. Res. Organ. 1958*, 1959 (83–4).

Seedlings of *Cupressus lusitanica* with 2-4 cotyledons, *Pinus patula* with 4–9, *P. elliottii* with 4–9, and *P. radiata* with 2–4, were separated by cotyledon numbers and planted out, but after 3–4 years no differences in survival or height growth were apparent between plants with different cotyledon numbers. [Cf. *F.A.* 20 No. 4157.]

1462. SRIVASTAVA, G. S. **Schizocotyly and polycotyly in *Adansonia digitata* Linn.** *Sci. & Cult.* 25 (3), 1959 (218–9). 6 refs. E.M.B.

Describes and illustrates tricotyly, tetracotyly, hemi-tricotyly and hemi-tetracotyly in seedlings of *A. digitata*.

1463. Hueck, K., and Lamprecht, H. Estudios morfológicos y ecológicos sobre la germinación y el desarrollo en la primera juventud de unas especies forestales venezolanas. **[Morphological and ecological studies of germination and juvenile development in some Venezuelan forest species.]** *Bol. Inst. For. Latino Amer., Mérida* No. 3, 1959 (1–21 + 10 plates). [Span.span.e.]

Presents information on the characteristics and properties of the seed and illustrated descriptions of seedling development up to the appearance of the first adult leaves, in the following species: *Cedrela mexicana*, *Anacardium rhinocarpus*, *Swietenia macrophylla*, *Ochroma lagopus*, *Erythrina poeppigiana*, *Delonix regia*, *Alnus jorullensis*, *Bombacopsis sepium* and *Tabebuia guayacan*.

165.3/.7. Heredity, Genetics and Breeding; Variation

See also Nos. 1455, 1504, 1506, 1511, 1527, 1624, 1657, 1669, 1671–2, 1677, 1813, 2020, 2505–7.

1464. Snyder, E. B. [Editor]. **Glossary for forest tree improvement workers**. Southern Forest Experiment Station, New Orleans. 1959. pp. 22.

Produced by the Committee on Forest Tree Improvement, Division of Silviculture, Society of American Foresters, the glossary contains definitions of 164 terms, mostly botanical and genetical. Some 40% of these appear in the Society's *Forestry Terminology* [see *F.A.* 19 No. 3738] but their definitions have been simplified for users of this glossary.

1465. Johnsson, H. Föreningen för Växtförädling av Skogsträd 1936–1958. **[Swedish Forest Tree Breeding Association 1936-58.]** [Föreningen för Växtförädling av Skogsträd, Ekebo.] 1959. pp. 68. [Sw.]

An account of its research, personnel and publications. The Association was reorganized in 1959 and will in future be known as Föreningen Skogsträdförädling.

1466. Rudolf, O. P. **Forest tree improvement research in the Lake States**. *Sta. Pap. Lake St. For. Exp. Sta.* No. 74, 1959. pp. 56. 6 refs.

Lists and classifies over 100 research projects undertaken by 11 agencies, briefly stating objects, methods, and results to date. Of these, 55 deal with Pines, 21 with Spruces and 16 with Poplars, *Pinus ponderosa* and *Picea glauca* being the most frequently studied species. There is also a brief decimal classification (by S. S. Pauley) and indexes to genera, research workers and co-operating bodies [cf. *F.A.* 18 No. 102].

1467. Worsley, R. G. F. **The processing of pollen.** *Silvae Genet.* 8 (5), 1959 (143–8). 11 refs. [E.e.g.f.]

Four different light-intensity, day-length and air-temperature treatments for the ripening of pollen were tested on a large number of species (chiefly conifers). Results are presented. Methods of extraction, cleaning, storage and determination of viability are also described. In germination tests in various media, solutions of H_2O_2 of strengths from ca. 1·1 to 0·1 g./litre were found to stimulate germination. A technique, applicable in the field, is also described for determining viability by the vital staining method.

1468. Toyama, S., and Nagata, J. **[F_1 trials with elite trees of Sugi (*Cryptomeria japonica* D. Don). (Breeding of forest trees and its fundamental studies, Report 30.)]** *Repr.* from *Memoirs, Faculty of Liberal Arts and Education, Miyazaki University* (*Natural Science*) No. 5, 1958 (1–10). 1 ref. [Jap. jap.g.]

Seed obtained by free pollination from 223 selected trees in plus stands was collected in 1940 and sown in 1941. After 3 years, 50 plants from each of 110 progenies that had proved resistant to drought, insects and fungi were planted out, with controls. In 1956, when the trial ended, 2 élite progenies were selected, and 2 élite trees were selected from each. Volumes of the 4 individuals ranged from 0·0926 to 0·1370 cu. m., compared with 0·0333 cu. m. for a control. *From authors' summary.*

1469. Langner, W. Ergebnisse einiger Hybridierungsversuche zwischen *Picea sitchensis* (Bong.) Carr. und *Picea omorika* (Pančič) Purkyne. **[Results of some trials in hybridization between *P. sitchensis* and *P. omorika*.]** *Silvae Genet.* 8 (5), 1959 (138–43). 5 refs. [G.g.e.f.]

Presents the results of trials made in (1) 1948, (2) 1949, (3) 1953, and (4) 1956. Crosses, carried out in both directions, resulted in very few seeds, but these showed normal vitality. Hybrids from (4) (the most extensive trials) exhibit hybrid vigour but those from (1), (2) and (3) do not. Hybrids from (4) are also clearly intermediate between the parents in reaction to snow, frost susceptibility and formation of leading shoot. *From author's summary.*

1470. Fairbairn, W. A. **Early controlled cross-fertilisation of European and Japanese Larches.** *Scot. For.* 13 (3/4), 1959 (167–9). 5 refs.

Gives details of crossing experiments (*Larix decidua* ♀ × *L. leptolepis* ♂, and reciprocal) begun by Murray at Murthly in 1914. Plants were obtained from both crosses, and planted out. The hybrids were destroyed by gales in 1953. These early experiments take priority over Leven's work [cf. *F.A.* 11 No. 874], which Larsen [cf. *F.A.* 18 No. 98] held to be the first on controlled crossing of these species.

1471. Kleinschmit, R. Eine Mendelspaltung bei der europäischen Lärche. **[Mendelian segregation in European Larch.]** From *abstr.* in *Silvae Genet.* 8 (4), 1959 (124). [G.]

Comparisons were made of height growth and position of the first-order branches in the following material: (1) 6-year-old grafts from 12 clones of 120- to 150-year-old plus-variants, (2) 6-year-old progeny of single trees of the same plus-variants, (3) 3-year-old progeny of single trees of different growth-form types, (4) 3-year-old progeny from stands in the tree's native habitat, i.e. Cracow, Breslau and Sudeten-Jägerndorf, and (5) 3-year-old progeny of a controlled crossing of the plus-variants $J_{2(1)}$ and $V_{2(4)}$. The following growth-form types were established: (*a*) Very thrifty élite trees, with a slender and straight growth habit, erect branches and the best height growth observed in the experiment, these characters being very stable. These were found in small numbers in only one clone of (1). (*b*) Trees of generally good growth, but with a wide-spreading crown, and with only the branch tips directed upwards, these characters being very variable. These were the most frequently occurring types and had the greatest vitality. (*c*) Unthrifty trees with poor height growth and a variety of types of undesirable growth habit. These were common in the progeny of two selfings. If the allele for straightness and good height growth is symbolized by *H*, that for a recumbent growth habit by *h*, that for upward-directed branches by *Z* and for downward-directed branches by *z*, it can be demonstrated that all 9 genotypes of a dihybrid Mendelian segregation can be distinguished in (4); slenderness, height and narrowness of crown on the one hand, and the recumbent form with hanging branches on the other, are taken to be the homozygotes and the existence of an intermediate process of inheritance is assumed. In (2) and (3) not all of the 9 types occurred. In (5) there was a reasonably good distribution of the 9 genotypes. Both of the phenotypic plus-variants are therefore heterozygotes. Such types are more likely than either (*a*) or (*c*) to attain a good age in forest with a closed canopy.

1472. LAGOV, I. A. Nekotorye ėkologo-biologičeskie osobennosti form *Larix sibirica* Ldb. **[Some ecological and biological features of forms of *L. sibirica*.]** *Bot. Ž.* 44 (9), 1959 (1347–51). 6 refs. [Russ.]

Eight sample trees of *L. sibirica* bearing violet-red cones (*a*) were compared with eight adjacent trees of similar dimensions, age, etc., having green cones (*b*). Trees growing in several different forest types were chosen for the comparison, which covered the years 1955–56. Cones (*a*) were larger, and seed from them was heavier and had higher germinative capacity and germinative energy than that from (*b*). The two forms occur together naturally on very different types of ground, but (*b*) grows up to the tree line, whereas (*a*) goes no higher than 1850–1900 m. alt. The names *L.s.* var. *violaceo-rubrostrobila* and *L.s.* var. *chlorostrobila* are proposed for (*a*) and (*b*) respectively. [Cf. *F.A.* 21 No. 1457.]

1473. NEKRASOVA, T. P. O značenii želtoj i rozovoj okraski mužskih šišek u vidov *Pinus*. **[The significance of yellow and pink colouring of male cones in *Pinus* spp.]** *Bot. Ž.* 44 (7), 1959 (975–8). 7 refs. [Russ.]

From observations on the phenology of Pines [*P. sylvestris* var. *lapponica*] with (1) yellow and (2) pink cones in the Kola peninsula, and on the laboratory germination, at various temperatures, of pollen from them and from *P. sylvestris* near Moscow, it is concluded that the cone colours indicate phenologically distinct forms, trees with (2) flowering earlier and in colder weather than those with (1) and having a lower optimum temperature for pollen germination.

1474. LANGLET, O. Norrlandstallens praktiska och systematiska avgränsning. **[The practical and systematic delimitation of Norrland Pine.]** *Svenska SkogsvFören. Tidskr.* 57 (3), 1959 (425–36). 25 refs. [Sw.]

Discusses the literature, and, in particular, N. Sylvén's monograph of 1916. Of the characters of cones, seed, needles, bark, and habit, which Sylvén uses to distinguish the subspecies *lapponica* and *septentrionalis*, only needle length, cone colour, thickness of cone scales and crown width are considered to be largely hereditary. The others, as has been shown in provenance trials, are largely conditioned by environment. On the basis of Sylvén's tabulated data for each locality investigated, index numbers indicating the degree of 'northernness' or 'southernness' are worked out and mapped (*a*) for the chiefly hereditary, (*b*) for the largely environmental characters and (*c*) for both, i.e. the phenotype. All three maps show great similarity and closely reflect local climatic differences, particularly in the southern transitional part of the area. It is concluded that this is a case of direct and indirect (i.e. selective) climatic influence, with all characters distinguishing Norrland Pine gradually increasing in frequency and intensity as one moves towards colder regions, i.e. a continuous (clinal) variability, with does not justify the drawing of fixed systematic distinctions. [Cf. *F.A.* 20 No. 2808.]

1475. RUBNER, K. Kiefernrassenstudien in der Deutschen Bundesrepublik. I. Teil: Die natürliche Verbreitung der Kiefer und ihre wichtigsten Rasseeigenschaften. II. Teil: Unterscheidung und Verbreitung der Kiefernrassen. **[Studies of races of Scots Pine in W. Germany. I. Natural distribution and chief racial characteristics. II. The individual races and their distribution.]** *Forstarchiv* 30 (9; 11), 1959 (165–75; 205–14). 61 refs. [G.]

Part I describes the history of Pine in the region with special reference to its western boundaries, tracing stands and isolated occurrences of undoubted local origin, especially relicts in Bavaria, and discusses the ecological significance of characters such as height growth, habit, light requirements (including phototropism), resistance to snow, wind and disease, etc. Part II describes ca. 20 individual races or local types and presents a provisional key, supported by many photographs.

1476. HUART, A. L'absorption d'oxygène par des graines de pin sylvestre (*Pinus sylvestris* L.) de diverses provenances. **[Absorption of O by *P. sylvestris* seed of different provenances.]** *Agricultura, Louvain* (*Ser. 2*) 5 (1), 1957 (3–13). 13 refs. [F.f.du.e.] C.G.B.

Consumption of O by whole and ground-up seeds from (*a*) N. Sweden, (*b*) Scotland, (*c*) Belgium and (*d*) S. France, measured by the Warburg method at 25° C., decreased in the order (*d*), (*b*), (*c*), (*a*). Assuming a northern or continental origin for the Belgian Pines, these results can be interpreted in terms of the geographical and ecological variability of *P. sylvestris*. Further study might allow O consumption of seeds to be used as a diagnostic test of their adaptive and therefore economic value for a given locality.

1477. Wright, J. W. **Species hybridization in the White Pines**. *For. Sci.* 5 (3), 1959 (210–22). 15 refs.

The results of 10 years' work on species hybridization with the 5-needled Pines at the Northeastern Forest Experiment Station are summarized. Including reciprocals, 36 different species combinations were attempted, of which 16 are regarded as successful or probably successful. Twelve of the 16 combinations have been authenticated in the nursery. Comparative trials were made of year-old pollen stored in a refrigerator or deep freeeze, and fresh pollen of the same species. In nearly all cases, total (filled plus empty) seed sets were similar for the two types of pollination, but sets of filled seeds were higher (appreciably so in 3 cases) after the use of fresh pollen than after the use of year-old pollen. The combinations *P. flexilis* × *P. griffithii*, *P. griffithii* × *P. strobus*, *P. ayacahuite* × *P. griffithii*, *P. ayacahuite* × *P. strobus*, *P. strobus* × *P. griffithii*, and *P. strobus* × *P. ayacahuite* are among the most promising. They gave maximum seed yields of 22·0, 9·3, 24·3, 21·2, 6·2, and 13·0 filled seeds per cone, respectively, and grew faster than seedlings of either parent species in the nursery. *Author's summary*.

1478. Hall, R. C. **Field tests of the resistance of hybrid Pines to the Pine reproduction weevil *Cylindrocopturus eatoni*]**. *Tech. Pap. Pacif. Sthwest. For. Range Exp. Sta.* No. 33, 1959. pp. [3] + 21. 3 refs.

A more detailed account of trials already reported [see *F.A.* 20 No. 2813] regarding *Pinus jeffreyi* × (*P. jeffreyi* × *P. coulteri*).

1479. Ching, K. K. **Hybridization between Douglas-Fir and Bigcone Douglas-Fir**. *For. Sci.* 5 (3), 1959 (246–54). 9 refs.

An experiment was made in 1956 to produce a hybrid of *Pseudotsuga taxifolia* and *P. macrocarpa*; ♀ parents of the cross were selected from a vigorous 30-year stand of *P. taxifolia*, and pollen of *P. macrocarpa* was obtained from S. California. Crossability was found to be low, although some fertile seeds were obtained. Study of 8 characters concerning growth, morphology and anatomy of the hybrid and open-pollinated progenies authenticates the hybridity of the seedlings resulting from cross-pollination.

1480. Beskaravajnaja, M. A. Gibridy klena jasenelistnogo. **[*Acer negundo* hybrids.]** *Lesn. Hoz.* 11 (9), 1958 (28–30). [Russ.]

In 1939–41 A. V. Al'benskij crossed ♀ *A. negundo* with ♂ *A. platanoides*. F_2 seedlings raised from seed of the best F_1 trees (open-pollinated *inter se*) were examined in 1952–54. The F_2 hybrids grew faster in both height and diameter than *A. negundo*. The characters of the latter were mostly dominant in both F_1 and F_2. In F_1 some bisexual individuals were found, and seed from these again gave a number of bisexual plants in F_2. Stem, crown and root form are discussed, and the advantages of the hybrids for shelterbelt and street planting in the S.E. of the U.S.S.R. are pointed out.

1481. Hejtmánek, J. K fenologické variabilitě buku. **[The phenological variability of Beech.]** *Práce Vyzkum. Úst. Lesn. ČSR* No. 15, 1958 (195–210). 21 refs. [Cz.cz.russ.g.]

[Cf. *F.A.* 18 No. 2618.] Possibilities in the selection of phenological forms are indicated.

1482. Žuravskaja, E. I. Gibridnyj oreh v sele Dubljany. **[A *Juglans* hybrid in Dublyany village [near Lvov].]** *Lesn. Hoz.* 11 (9), 1958 (75–6). [Russ.]

Describes a *J. regia* × *J. nigra* [origin not specified], > 90 years old, 22 m. high, g.b.h. 4.2 m. Its seeds have a germination % of 81·7, and 1-year seedlings average 24·9 cm. in height (max. 46 cm.). The hybrid appears to be more frost-resistant than the parent species.

1483. Al'benskij, A. V. Gibridy akacij. **[*Robinia* hybrids.]** *Lesn. Hoz.* 11 (9), 1958 (74–5). [Russ.]

Robinia pseudoacacia and *R. neomexicana* were crossed in 1949 in an effort to produce a more frost-resistant hybrid. The shoots of the hybrids suffered more from frost than those of *R. pseudoacacia*, but their height growth was better than that of the parents when planted near Moscow. The hybrids flowered in 1957.

1484. Ruggeri, C. Alcune osservazioni sulla variabilità dei caratteri morfologici di *Eucalyptus* × *trabutii* Vilmorin in F_1 ed F_2. **[Notes on the variability of morphological characters of *E.* x *trabutii* in F_1 and F_2 generations.]** *Pubbl. Cent. Sper. Agric. For., Roma* 2, 1959 (203–21 + 2 plates). 9 refs. [It.it.e.*e*.]

The characters studied were: bark (persistence and morphology), mature leaf (habit, shape, dimensions, angle of venation, length of petiole), inflorescence (length, number of buds, length of bud pedicel) and fruit (shape, diameter, and length). The characters studied appear to fall into two well defined groups, which are transmitted to the hybrid independently of each other, and which are represented respectively by the bark and by the leaf/bud complex.

1485. Bouvarel, P., and Lemoine, M. Hybridation des trembles et peupliers blancs à la Station de Recherches de Nancy. **[Hybridization of Aspens and White Poplars at the Research Station at Nancy.]** *Rev. for. franç.* 11 (10), 1959 (679–98). 8 refs. [F.]

A detailed account of the experiments. The 86 artificial crosses effected comprise the following types: (*a*) intraspecific crosses: *Populus tremula* × *P. tremula*, *P. nivea* × *P. nivea*, *P. tremuloides* × *P. tremuloides*; (*b*) interspecific crosses (F_1): *P. tremula* × *P. tremuloides* (and its reciprocal), *P. tremula* × *P. grandidentata*, *P. nivea* × *P. tremula* (and its reciprocal), *P. nivea* × *P. grandidentata*, *P. nivea* × *P. tremuloides* (and its reciprocal); (*c*) interspecific crosses (F_2): *P.* (*tremula* × *tremuloides*) × *P.* (*tremula* × *tremuloides*); (*d*) back crosses: *P. tremula* × *P.* × *canescens* and *P. nivea* × *P.* × *canescens*. The resistance of the hybrids to various insects and diseases, and their height growth are discussed. Whereas *P. tremula* is very susceptible to *Venturia* *tremulae*, the hybrids of *P. tremula* with American Aspens (*P. grandidentata* and *P. tremuloides*) are strikingly resistant and also display a considerable degree of heterosis (height of *P. tremula* × *P. tremuloides* at 5 years, 335–359 cm. vs. 162 cm. for *P. tremula*).

1486. Ortmann, C. Beobachtung über das Vorkommen autochthoner, baumförmiger *Salix*-Spezies und ihre Bedeutung für die Forstpflanzenzüchtung. **[The occurrence of native tree Willows and their significance for tree breeding.]** *Silvae Genet.* 8 (5), 1959 (133–7). 12 refs. [G.g.e.f.]

Three different sites carrying tree Willows were investigated and are described. Various indications were found to suggest that the native German *Salix* spp. have specific ecological requirements, and this should be taken into account in tree breeding and afforestation. The chief species investigated were *Salix alba*, *S. pentandra* and *S. caprea*. *From author's summary.*

1487. Moravskaja, A. S. Dve formy vjaza i beresta. **[Two forms of Elm.]** *Lesn. Hoz.* 11 (7), 1958 (79). [Russ.]

Notes on the flushing dates of early and late forms of *Ulmus laevis* and *U. campestris* in the Tellerman Forest, Voronezh.

1488. Šeršukova, O. P. Čislo hromosom u *Ulmus pinnato-ramosa* Dieck. et Koehne. **[Chromosome number in *U. pumila* var. *arborea*.]** *Dokl. Akad. Nauk SSSR* 127 (1), 1959 (210–2). 8 refs. [Russ.] A.P.B.

Discusses the identity and nomenclature of *U. p.* var. *arborea*, chromosome counts of which showed $2n = 28$. This indicates that the *U.* '*turkestanica*' cited by Seitz [cf. *F.A.* 13 No. 1868] as having $2n = 56$ is probably not *U. p.* var. *arborea*, but may be *U. densa* or *U. androssowii*.

1489. Sharma, A. K., and Bhattacharyya, N. K. **Chromosome studies on four different species of *Cinnamomum*.** *Jap. J. Bot.* 17 (1), 1959 (43–54). 6 refs. [E.e.] C.G.B.

A cytological study of *C. camphora*, *C. zeylanicum*, *C. tamala* and *C. iners*. Chromosome number of all 4 species is $2n = 24$.

168. Histology

See Nos. 1406, 1680, 1722, 1799, 2026, 2277 *et seq.*

17. Systematic Botany

172.3. Schizophyta (Bacteria and Blue-green Algae)

See Nos. 2022, 2052–3.

172.8. Eumycetes (True Fungi)

See also Nos. 1978 *et seq.*, 2053, 2464 *et seq.*

1490. Nukumizu, T., Ando, M., and Dozono, Y. **[On the ecological, physiological and morphological characters on the fruit body of 'Shiitake', *Cortinellus edodes* (Berk.) S. Ito et Imai.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 116, 1959 (27–57). 3 refs. [Jap.e.]

1491. Jacquiot, C. Étude comparée de *Phellinus robustus* (B. et G.) Karst. et de *P. hartigii* Allesch. et Schn. en culture. **[Comparative study of *Fomes robustus* and *F. hartigii* in culture.]** *C.R. Acad. Sci., Paris* 249 (16), 1959 (1548–53). 12 refs. [F.f.] O.R.S.

Describes their morphology and physiology (including the rate of decay of Oak and Chestnut by *F. robustus* and of Silver Fir by *F. hartigii*, the saprophytic nature of *F. hartigii* and the parasitic one of *F. robustus*), concluding that the two are distinct species.

1492. Barr, M. E. **Northern Pyrenomycetes. I. Canadian Eastern Arctic.** *Contr. Inst. Bot. Univ. Montréal* No. 73, 1959. pp. 101. 63 refs. [E.]

173.5. Pteridophyta, Vascular Cryptogams

1493. Alston, A. H. G. **The ferns and fern allies of West Tropical Africa.** Crown Agents for Oversea Governments and Administrations, London. 1959. pp. vii + 89. 4 refs. Price 7*s.* 6*d.*

A supplement to the second edition of the Flora of West Tropical Africa [see *F.A.* 20 No. 1480].

174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists

1494. Raizada, M. B. **Mussoorie and its plants: a preliminary survey.** *Indian For.* 85 (11), 1959 (668–90). 11 refs.

Lists 1331 species.

1495. Las plantas cultivadas en la República Argentina. **[Plants cultivated in Argentina.]** Instituto de Botánica Agrícola, Secretaria de Estado de Agricultura y Ganadería de la Nación, Buenos Aires. 1958–1959. [Span.]

Further parts [cf. *F.A.* 18 No. 3734] dealing with: Vol. 1 (Fasc. 19) Araucariaceae (*W. H. G. Barrett*; pp. 27); 5 (90) Pittosporaceae (*C. E. Marthi*; pp. 17); 5 (91) Hamamelidaceae (*V. A. Milano*; pp. 13); 7 (112) Celastraceae (*V. A. Milano*; pp. 24); 7 (115) Aceraceae (*F. R. Alberti*; pp. 47); 7 (126) Sterculiaceae (*E. P. Molinari* and *V. A. Milano*; pp. 23); 8 (135) Caricaceae (*V. A. Milano*; pp. 13); 8 (142) Punicaceae (*V. A. Milano*; pp. 11); and 10 (173) Bignoniaceae (*H. A. Fabris*; pp. 57).

174.2/.7. Gymnosperms

See also Nos. 1421–3, 1449, 1472–5, 1523, 1577.

1496. Selik, M. Kızılçam (*Pinus brutia* Ten.) 'in botanik özellikleri üzerinde araştırmalar ve bunların halepçamı (*Pinus halepensis* Mill.) vasıfları ile mukayessi. **[Botanical investigations on *P. brutia*, especially in comparison with *P. halepensis*.]** *Istanbul Üniv. Orm. Fak. Derg.* 8*A* (2), 1958 (161–98). 33 refs. [Turk.g.*g*.]

The investigations covered shoot development, needle anatomy, reproduction, and the morphology of seedlings and young plants. Varieties and their site requirements are also discussed.

1497. Ueno, J. **Relationships of genus *Tsuga* from pollen morphology.** *Journal of the Institute of Polytechnics, Osaka City University, Osaka* (*Ser. D*)

No. 8, 1957 (191–201). [Jap.?] From *abstr.* in *Biol. Abstr.* 34 (1), 1959 (No. 2249).

On the basis of pollen morphology, proposes a subgenus *Hesperopeuce* (represented by *Tsuga pattoniana*), more primitive than subgenus *Eutsuga*.

175.2. Monocotyledons

See also Nos. 1453, 1604, 2333.

1498. DAHLGREN, B. E. **Index of American Palms. (Plates.)** *Botanical Series, Field Museum of National History, Chicago* Vol. 24 (plates), 1959. pp. [1] + 412 plates.

The index itself appeared in 1936.

176.1. Dicotyledons

See also Nos. 1415, 1459, 1527, 2296.

1499. PELLEGRIN, F. Guttifères d'Afrique Équatoriale. **[Guttiferae of Equatorial Africa.]** *Bull. Soc. Bot. France* 106 (5/6), 1959 (216–30). [F.] O.B.D.

A taxonomic study with keys to species of 10 genera and a description of a new tree species, *Garcinia echirensis*.

1500. WILLIAMS, L. O. **Guttiferae from Middle America.** *Trop. Woods* No. 111, 1959 (15–8 + 1 plate).

Describes *Chrysochlamys eclipes* and *Tovomita macrophylla* spp. nov.

1501. MORS, W. B., GOTTLIEB, O. R., and VATTIMO, I. DE. **Phylogeny of the genus *Aniba* Aubl. A comparative morphological and chemical observation.** *Nature, Lond.* 184 (4698), 1959 (1589). 9 refs.

A number of α-pyrones are known to occur in several species of *Aniba*. Chemically these can be divided into two groups, according to the presence (*A*) or absence (*B*) of a methoxyl group at C atom 4 of the pyrone ring. (*A*) compounds have been found in *A. rosaeodora*, *A. duckei* and *A. firmula*, and (*B*) compounds in *A. coto* and *A. pseudocoto*. On the hypothesis that the loss of the O function at C atom 4 indicates a more recent origin in the evolutionary history of the genus, a comparative analysis was made of the floral verticils of the known species of *Aniba*, which confirmed the position of group (*A*) species as being more primitive than that of group (*B*).

1502. SMITINAND, T. **[Nonsi (*Peltophorum* spp.).]** *Vanasarn* 17 (3), 1959 (39–40). [Siam.e.]

In view of their potential value as fast-growing pioneer timber species in Siam, the author tabulates the main diagnostic features of *P. dasyrachis* and *P. inerme*.

1503. LEROY, J. F. Le genre *Heimodendron* Sillans d'Afrique centrale est un *Entandrophragma*. **[The Central African genus *Heimodendron* is an *Entandrophragma*.]** *J. Agric. trop. Bot. appl.* 5 (12), 1958 (856–7). 5 refs. [F.] P.O.

[Cf. *F.A.* 16 No. 171.] Reduces *H. tisseranti* to synonymy with *Entandrophragma palustre*, and discusses the distribution of the latter.

1504. TIXIER, P. Sur le faux mangoustan. **[*Sandoricum indicum*.]** *J. Agric. trop. Bot. appl.* 5 (8/9), 1958 (596–7). [F.] P.O.

Describes briefly the tree and its edible fruit, and gives details, with drawings, of its mitosis.

1505. JARRETT F. M. **Studies in *Artocarpus* and allied genera, III. *Artocarpus* subgenus *Artocarpus*.** *J. Arnold Arbor.* 40 (2; 3; 4), 1959 (113–55; 298–368). [Cf. *F.A.* 20 No. 2863.]

1506. PRYOR, L. D. **Evolution in *Eucalyptus*.** *Aust. J. Sci.* 22 (1), 1959 (45–8, ix). 7 refs. O.R.S.

(A contribution to the "Origin of Species—a Centennial Symposium", part of the Fifth Annual General Meeting of the Australian Academy of Science.) A review of present knowledge, discussing the fossil record, isolation in *Eucalyptus* (in E. and W. Australia), the evolution of ecological behaviour, variation within subgenera, species stability, breeding barriers between species within subgenera, species origin by introgression, and variation within species.

1507. CARR, D. J., and CARR, S. G. M. **Floral morphology and the taxonomy of *Eucalyptus*.** *Nature, Lond.* 184 (4698), 1959 (1549–52). 20 refs.

A detailed review, from the literature and from the authors' own studies, leading to the conclusion that *Eucalyptus* may have had a polyphyletic origin and that *Monocalyptus*, in particular, may have developed independently of the rest of the genus. [Cf. *F.A.* 21 Nos. 1459–60.]

1508. WILSON, K. A., and WOOD, C. E., JR. **The genera of Oleaceae in the Southeastern United States.** *J. Arnold Arbor.* 40 (4), 1959 (369–84). Many refs.

1509. HOWARD, R. A. **Studies in the genus *Coccoloba*, VII. A synopsis and key to the species in Mexico and Central America.** *J. Arnold Arbor.* 40 (2; 3), 1959 (176–220). 10 refs.

[Cf. *F.A.* 20 No. 2865.] In general, the genus has been over-described in Mexico and Central America, and of the 80 names that have been published, only 33 are recognized in this paper.

1510. VERDCOURT, B. **Remarks on the classification of the Rubiaceae.** *Repr.* from *Bull. Jard. Bot. Brux.* 28 (3), 1958 (209–81 + 16 plates). 52 refs. [E.]

A brief history of the attempts to classify the Rubiaceae is given, and recently proposed characters are discussed. Hair and pollen characters have been examined in numerous genera, and are discussed. A new classification of the family is suggested.

1511. MÜLLER, R. Altstammsorten der Schwarzpappelbastarde. (IIn,o). **['Old stock varieties' of Black Poplar hybrids: II n,o.]** *Holz-Zbl.* 85 (114; 138), 1959 (1521–3; 1858–60). 11 + 11 refs. [G.]

(*n*) The 'Neupotz' Poplar of Baden and the Palatinate, considered the most valuable variety on the flood-plains in the region, is distinguished from *P.* × *regenerata*, and the cultivar going under the name "fremontii" is identified with it. (*o*) The 'Forndorf' Poplar, which is considered identical with clones going under the name of P. "regenerata" in Western Europe, has been named 'Forndorf' by the German Pappelmarkenetikett authority to distinguish it clearly from 'Regenerata Deutschland'. Synonyms, trade names and identification in the wider 'Regenerata' group, comprising "Forndorf", "Regenerata Deutschland", "Grandis" and "Leipzig" [cf. *F.A.* 20 No. 4213] are tabulated. The cultivar is considered hardy, and resistant to canker but not to rust, and is recommended for sites that are climatically somewhat adverse (e.g. in Schleswig Holstein).

1512. WOOD, C. E., JR. **The genera of Theaceae of the Southeastern United States.** *J. Arnold Arbor.* 40 (4), 1959 (413–9). Many refs.

18. Plant Ecology

See also Nos. 2596, 2602.

181. Mode of Life, Autecology. Silvicultural Characters of Trees

See also Nos. 1486, 1496, 1511, 1654, 1667.

1513. MERENDI, A. Il larice, dopo l'abete rosso, la conifera più diffusa d'Italia. **[Larch, after Spruce, the commonest conifer in Italy.]** *Ital. agric.* 96 (8), 1959 (702–14). 8 refs. [It.] E.M.B.

Botanical and silvicultural characters, distribution etc.

1514. ***Pinus patula*** **Schlechtendal et Chamisso.** *Bois For. Trop.* No. 67, 1959 (37–42). 13 refs. [F.]

Briefly describes morphology, wood anatomy and ecology, and (more fully) plantation technique, tending, and management, all with reference to conditions in S. Africa.

1515. JAMES, R. L. **Carolina Hemlock—wild and cultivated.** *Castanea* 24 (3), 1959 (112–34). Many refs.

Notes—partly original, and partly from literature and correspondence—on *Tsuga caroliniana*, covering description, natural range, habitat and associated plants, big trees, history of its discovery, and records of its cultivation as an ornamental species in the eastern U.S.A.

1516. HART, A. C. **Silvical characteristics of Balsam Fir (*Abies balsamea*).** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 122, 1959. pp. 22 + 1 photo. 58 refs.

1517. HART, A. C. **Silvical characteristics of Red Spruce (*Picea rubens*).** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 124, 1959. pp. 19 + 1 photo. 43 refs.

1518. NELSON, T. C. **Silvical characteristics of Mockernut Hickory (*Carya tomentosa* Nutt.).** *Sta. Pap. Stheast. For. Exp. Sta.* No. 105, 1959. pp. 10. 19 refs.

1519. SHIPMAN, R. D. **Silvical characteristics of Winged Elm (*Ulmus alata* Michx.).** *Sta. Pap. Stheast. For. Exp. Sta.* No. 103, 1959. pp. 7. 16 refs.

1520. NIKOLOVSKI, T. Diviot baem (*Prunus webbii* Vierh.) eden interesen vid za šumskokultirnite raboti. **[*P. webbii*—an interesting species for reforestation work.]** *Godišn. Šum. Inst., Skopje* 2 (1), 1957 (45–58). 19 refs. [Maced.g.*g*.]

Discusses taxonomy, morphology, distribution (especially in Macedonia), and ecological and silvicultural characters. It is found in thermophilous mixed forest stands of the *Carpinion orientalis* and its derivatives, at 100-500 m. alt., and is well suited as a pioneer species on the eroded limestone country of the arid parts of central Macedonia.

181.1. Distribution, Natural Range

See also No. 1532

1521. DANSEREAU, P. Phytogeographia Laurentiana. I. Introduction et méthodologie. **[Phytogeography of the Laurentian region of Canada. I. Introduction and methods.]** *Contr. Inst. Bot. Univ. Montréal* No. 74, 1959. pp. 18. 20 refs. [F.]

Sketches the plan of a projected series of publications on the distribution of plant species and associations. [Cf. *F.A.* 21 No. 1612.]

1522. GAJDARSKI, K. Njakogašnoto i segašnoto razprostranenie na iglolistnite dărvesni vidove v Etropolskija balkan. **[Former and present distribution of coniferous species in the Etropole mountains [near Sofia].]** *Gorsko Stopanstvo* 15 (8), 1959 (19–23). [Bulg.]

Discusses the present distribution of Spruce and Silver Fir (much less now than in the past) and, briefly, some of the afforestation measures now being undertaken with these species and Pine.

1523. GROZDOV, B. V. Vorotničkovaja sosna. **[*Pinus sylvestris* var. *annulata*.]** *Lesn. Hoz.* 11 (9), 1958 (76). [Russ.]

Discusses the discovery of the variety in the Bryansk region, and also Polish and German work on it [cf. *F.A.* 17 No. 2503].

1524. LI, A. D., and ZAKIROV, P. K. Nahodka arči *Juniperus seravschanica* Kom. na Nuratinskom hrebte. **[A find of *J. seravschanica* in the Nuratin [Nuratau] range [Uzbekistan].]** *Bot. Ž.* 44 (9), 1959 (1336–7). 7 refs. [Russ.]

Confirms the presence of the species in the area, where it was formerly widespread.

1525. GUSEV, JU. D. O verhnem predele proizrastanija derev'ev i kustarnikov v Gorno-Badahšanskoj Avtonomnoj Oblasti. **[The upper limit of tree and shrub species in the Gorno-Badakhshan Autonomous Region [Tadzhikistan].]** *Bot. Ž.* 44 (8), 1959 (1158–62). 7 refs. [Russ.]

Presents in a table the max. altitudes attained by 25 tree and shrub species in the region as observed by A. V. Gurskij, the Pamir Biological Station, and/or the author himself.

1526. FUKAREK, P. Da li je cretna breza (*Betula pubescens* Ehrh.) raširena i na području Bosne i Hercegovine? **[Does *B. pubescens* occur in Bosnia and Herzegovina?]** *Repr.* from *Narodni Šumar, Sarajevo* 11 (1/3), 1957 (31–9). 17 refs. [Croat.g.]

Reports the discovery of a stand of Birch very closely allied to *B. pubescens*, at a site in E. Bosnia of > 1000 m. alt.

1527. Clausen, K. E. **New data on distribution of the Paper Birch × Bog Birch hybrid in Minnesota.** *Minn. For. Note* No. 81, 1959. pp. 2. 2 refs.

A description of *Betula × sandbergii*, and the habitats in which it was found in 50 localities in the state.

181.2. Atmospheric Relations. Acclimatization

See also Nos. 1425–7, 1433, 1454, 1456, 1531, 1533, 1569, 1648 *et seq.*, 1787, 1916, 1918–24.

1528. **[Light requirements of Dipterocarp seedlings].** *Extr.* from *Rep. For. Dep. N. Borneo 1958*, 1959 (20).

An experiment was laid down at Sibuga Forest Reserve to determine the optimum light conditions for the establishment and growth of seedling regeneration of various species of Dipterocarps. Shade houses giving light values of 100 (open), 87, 75, and 50% are being used, and Dipterocarp seedlings planted within them. Very great differences in establishment, health, and vigour are evident under the different shade conditions, and it appears probable that shade is very beneficial to establishment, and that a light value of 50–75% gives the best subsequent development.

1529. Nitsch, J. P. Réactions photopériodiques chez les plantes ligneuses. **[Photoperiodism in woody plants.]** *Bull. Soc. Bot. France* 106 (5/6), 1959 (259–87). 19 refs. [F.] O.B.D.

A review based on world literature.

1530. Hellmers, H., and Sundahl, W. P. **Response of *Sequoia sempervirens* (D. Don) Endl. and *Pseudotsuga menziesii* (Mirb.) Franco seedlings to temperature.** *Nature, Lond.* 184 (4694), 1959 (1247–8). 4 refs.

It has already been shown [see *F.A.* 18 No. 3767] that *Pinus taeda* seedlings make maximum height growth when day temperature (d.t.) is 12–13° C. higher than night temperature (n.t.), growth decreasing as the two approach equality, regardless of absolute level. In order to determine whether other conifers require such diurnal temperature fluctuations, seedlings of *S. sempervirens* and *P. menziesii* (*taxifolia*) were grown under a series of temperatures. It was found that the top growth of *S. sempervirens* seedlings responds significantly to d.t.; only when d.t. was low (7°) did increased n.t. significantly increase growth. Root growth, however, is less responsive. *P. taxifolia* from the same region (northern California) showed a marked optimum for top growth within the range of temperatures studied, viz. 17° d.t. with both 7° and 23° n.t. Root growth exhibited the same optimum, as well as better growth at 7° n.t. These results show that a diurnal temperature variation is not required for maximum growth of *S. sempervirens*. The case is not so clear for *P. taxifolia*; it makes maximum growth with 10° diurnal variation, but growth is inhibited by a diurnal variation of 16°.

181.3. Water, Soil and Root Relations

See also Nos. 1648, 1926–9, 2373.

1531. Bazukis, E. V., and Hansen, H. L. **A provisional assessment of species synecological requirements in Minnesota forests.** *Minn. For. Note* No. 84, 1959. pp. 2.

Information previously published on the moisture, nutrient, temperature, and light requirements of 32 tree, 55 shrub, 5 climber, 18 fern, 5 lichen, and 68 herbaceous species has been compiled, corrected from local surveys, and converted into a uniform scale of relative values from 1 to 5 in increasing order of apparent requirements, separately for trees, shrubs, climbers, etc.

1532. Moore, C. W. E. **Interaction of species and soil in relation to the distribution of Eucalypts.** *Ecology* 40 (4), 1959 (734–5). 18 refs.

Two species of *Eucalyptus* (*E. rossii* and *E. melliodora*) were grown in both pure and mixed pot cultures in soils obtained from neighbouring communities in which the two species were the dominants. The data indicate that the tolerance ranges for some edaphic factors [see *F.A.* 21 No. 319] overlap, and that under these conditions the presence or absence of interspecific competition will determine the community that develops on a particular site. It is suggested that investigations of species distribution and plant-habitat relationships must include studies of interspecific competition in relation to habitat factors. *From author's summary.*

181.31. Water Relations

See also Nos. 1353 *et seq.*, 1424–5, 1763, 2002, 2007, 2010–2, 2305–6, 2490.

1533. Løfting, E. C. L. Danmarks ædelgranproblem, 2.del. Dyrkningsbetingelserne for *Abies alba* (Mill.) og *Abies nordmanniana* (Spach.) i Danmark. **[The problem of Silver Fir in Denmark. Part 2. Growth conditions for *A. alba* and *A. nordmanniana* in Denmark.]** *Forstl. Forsøgsv. Danm.* 26 (1), 1959. pp. 249. 71 refs. [Dan.dan.e.*e.*]

[Cf. *F.A.* 17 No. 2688.] Differences between Norway Spruce and *A. alba* as regards frost hardiness, root system and rooting zone, moisture requirements and supply, susceptibility to butt rot, etc. are discussed. The main limiting factor for *A. alba* in Denmark is moisture, particularly in relation to the high rate of evaporation during the flushing period, when moisture deficiency may occur although the water reserve in the rooting zone is not exhausted. Experiments on water consumption were made in April–Aug. 1957, using Ladefoged's method [see *F.A.* 19 No. 79], on three trees of *A. alba* and one of Norway Spruce in a 36-year mixed stand at Torskov. Results are shown in graphs. During April and May, water consumption of the two species was similar, but in June–August that of Spruce dropped both absolutely and in relation to that of Fir. On 3 Aug., after a dry period, two of the Firs were sawn under water, with a subsequent considerable increase in water consumption above that of the previous day. On 6 Aug., the remaining Fir and the Spruce were watered thoroughly; the water consumption of the Spruce during that day increased to twice that on the 2 Aug. and that of the Fir by only 5%. On 7 Aug. the same two trees were sawn under water; the water consumption of the Fir increased by 60% compared with about 5% for the Spruce, and the water consumption by the two species was again roughly at the same level. Conclusions drawn are that water requirements for maximum evaporation are similar for the two species, that Spruce is able to meet a high evaporation requirement while the rooting zone is moist but has to reduce its water consumption early in a dry period, and that the transport of water from the roots of Fir takes place too slowly to compensate for maximum evaporation. Susceptibility to drought in *A. alba* is most pronounced during the flushing period, 16 May–30 June, partly because of the high cuticular evaporation related to the flushing itself and partly because at this season in Denmark evaporation requirements are usually at their highest, with intense radiation, low air humidity, few clouds, little rainfall etc. A formula is proposed for calculating $Æ_{kf}$, the normal climatic moisture deficiency, based on maximum evaporation, rainfall, number of misty days and amount of dew. Calculations—excluding the amount of dew, which is still being studied—are presented for various stations; they show considerable variations from place to place and with aspect, W. and N. aspects giving the most, and E. aspects the least, favourable climatic conditions. In view of *A. alba*'s shade-bearing properties, planting under the shelter of old stands or of a nurse crop to reduce evaporation is recommended. An anatomical study of the needles has shown that in young plants and in shaded needles, the hypodermal layer is very incompletely developed, whereas in older trees it may be strongly developed in needles in full light; the significance of this in relation to cuticular evaporation is discussed. Susceptibility to late frost is confined to young plantations; protective measures are discussed. Generally speaking, climatic requirements of *A. alba* in Denmark are little affected by provenance, but *A. nordmanniana* shows considerably more variation, especially in date of flushing. The early-flushing types are closely related to *A. alba* and need similar measures to reduce damage by late frost and from moisture deficiency. With the late-flushing types, moisture deficiency is generally of secondary importance, the $Æ_{fk}$ values during the flushing period being much lower than for *A. alba* or early-flushing *A. nordmanniana* in the same locality. For these late-flushing types the length and warmth of the growing period after flushing will determine the suitability of a locality, choice of site and silvicultural treatment.

1534. NAUMOV, Z. Režim na počvenata vlaga i zalesitelnite meroprijatija. **[Soil moisture and afforestation.]** *Gorsko Stopanstvo* 14 (10), 1958 (34–43). [Bulg.]

Changes in soil m.c. are plotted from April 1954 to March 1955, in spots or patches similar to those cleared for afforestation in Bulgaria. The soil m.c. at which death from drought occurs was determined for young plants of several important species: *Quercus robur* 6·2%, *Q. sessiliflora* 4·5%, *Q. cerris* 8·4%, *Pinus nigra* var. *austriaca* 7·1%, *Gleditsia* sp. 4·4%, *Acer* sp. 5·7% etc. The significance of these findings is briefly discussed in the context of Bulgarian afforestation.

1535. ŠIPČANOV, I. Proučvane suhoustojčivostta na mestnite listopadni dăbove i na amerikanskija červen dăb. **[Study of the drought resistance of local [Bulgarian] deciduous Oaks and *Quercus borealis* var. *maxima*.]** *Gorsko Stopanstvo* 14 (7), 1958 (24–30). [Bulg.]

One-year seedlings of (*a*) *Q. robur*, (*b*) *Q. sessiliflora*, (*c*) *Q. pubescens*, (*d*) *Q. conferta*, (*e*) *Q. cerris* and (*f*) *Q. borealis* var. *maxima* were kept for 40 days in June–July in soils of nine different moisture contents (from ca. 9 down to ca. 4%), and later examined for survival. Results showed that (*b*) was least drought-resistant, followed in order by (*f*), (*e*), (*d*) and (*a*), with (*c*) the most resistant. The manner of growth (i.e. normal, from axillary buds, sprouting from the root collar, etc.) of the six species at various low soil moisture contents is discussed, and the normal rates of height growth of 1- and 2-year-old plants of the six species are compared; (*c*) and (*d*) were by far the slowest growing.

181.32/34. Soil and Nutrient Relations

See also Nos. 1335–6, 1338–40, 1345–6, 1349, 1584, 1704, 1762–3, 1772, 2197.

1536. GRUZDEV, D. M. Osobennosti rosta drevesno-kustarnikovyh porod na zasolennyh zemljah. **[Growth of trees and shrubs on saline soils.]** *Lesn. Hoz.* 11 (8), 1958 (42–4). [Russ.]

[Cf. *F.A.* 21 No. 239.] Discusses the results of trial plantings of many species in the irrigated, treeless, cotton-growing region of S.E. Azerbaijan. *Elaeagnus angustifolia* and *Tamarix* sp. grew well even at salt concentrations of 0·6–1·5% in the soil. *Pinus eldarica*, *Ulmus pumila* var. *arborea*, *Platanus orientalis*, *Morus alba*, *Robinia pseudoacacia*, *Gleditsia caspica*, *G. triacanthos*, *Sophora japonica*, *Maclura pomifera*, *Punica granatum*, *Amorpha fruticosa* and *Melia* sp. grew successfully at salt concentrations of 0·4–0·6%. *Populus* × '*canadensis*', *P. nigra* var. *italica*, *P.* [*alba?*], *Fraxinus pennsylvanica*, *Catalpa* [*speciosa*?], *Quercus castaneifolia*, *Q. longipes*, *Juglans regia*, and *Salix arbuscula* grew well at salt concentrations of 0·2–0·3%. The sharp difference in height and diameter between trees growing on soil with low and medium salt concentrations is discussed. *R. pseudoacacia* (18 years) growing on soil with 0·840% salt averaged 4·5 m. high, 4·4 cm. d.b.h., 0·07 cu. m. in volume, and had 0·329 kg. of leaves and 11·9 g. of seeds per tree; trees on soil with 0·251% salt showed values of 11·3 m., 9·5 cm., 0·34 cu. m., and 2·267 kg. and 29·3 g. respectively.

1537. TAMM, C. O. Förrådet av växtnäringsämnen i mark och bestånd med särskild hänsyn till den nordsvenska tallhedens produktionsekologi. **[The amount of plant nutrients in the soil and in the stand, with special reference to the production ecology of N. Swedish Pine heaths.]** *Svenska SkogsvFören. Tidskr.* 57 (3), 1959 (515–27). 19 refs. [Sw.e.*e*.]

A discussion, based on literature and some unpublished Swedish data, with special reference to N contents of various soil layers, N consumption, and N removal in the stem and bark of harvested trees. On the poorer Pine heath of Norrbotten, the N reserves in the humus layer are estimated at only ca. 200 kg./ha.

1538. Irmak, A. Altı muhtelif cins iğne yaprakli orman ağaci fidanlarının fidanlık toprağından aldığı besin maddeleri üzerine araştırmalar. **[Investigations on the nutrient uptake of young plants of six different native conifers.]** *Istanbul Üniv. Orm. Fak. Derg.* 8*A* (2), 1958 (5–30). 15 refs. [Turk.g.*g*.]

Determines the Ca, Mg, K, P and N contents of (*a*) needles, and (*b*) stem + branches + roots, of seedlings of *Pinus sylvestris*, *P. nigra*, *P. brutia*, *Picea orientalis*, *Cedrus libani* and *Abies bornmuelleriana*, of various ages up to 2 + 3, growing in nursery and transplant beds. Results are tabulated in detail, and discussed at length in the German summary.

1539. Tsuda, K. **[Study on the nutrients uptake by Todo Fir [*Abies mayriana*] (I). Effects of three elemental fertilizers on the growth and nutrient content of Todo Fir seedlings.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 116, 1959 (65–73 + 2 plates). 12 refs. [Jap.e.*e*.]

Seedlings were grown (*a*) with complete fertilizer, (*b*) with no fertilizer, (*c*) with P + K, (*d*) with N + K, and (*e*) with N + P. After 2 years, plants on (*b*) and (*c*) were of poor appearance, and roots of (*d*) plants were also poor. Relative mean values of dry weight of seedlings were: (*a*) 100, (*b*) 56, (*c*) 65, (*d*) 75, and (*e*) 86. There was no significant difference in height.

1540. Harada, H. **[Effects of soil nutrient levels on the growth and nutrient uptake by forest seedlings. II. Interaction effects of nitrogen and phosphorus supply on the growth and nutrient uptake by Karamatsu (*Larix kaempferi* Sarg.) 1-0 seedlings.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 108, 1958 (83–113 + 7 photos). 27 refs. [Jap.e.*e*.]

[Cf. *F.A.* 20 No. 243.] Foliage symptoms, growth, and mineral uptake of 1 + 0 Larch seedlings given various N and P combinations in the soil were studied in pot cultures. Symptoms of N deficiency were observed in leaves of seedlings grown without N, irrespective of the supply of P, and symptoms of P deficiency in those grown without P; symptoms of P deficiency also appeared when N supply was increased. Uptake of K was unaffected by either N or K alone, but increased when both were present. Ca concentration and uptake decreased in the absence of P, were unaffected by P without N, and increased by P + N.

1541. Ingestad, T. **Studies on the nutrition of forest tree seedlings. II. Mineral nutrition of Spruce.** *Physiol. Plant., Copenhagen* 12 (3), 1959 (568–93). 70 refs. [E.e.]

In this second series, on similar lines to I [cf. *F.A.* 18 No. 3776], growing time was 160 days at 20° C. and pH 4–5. The control solution, considered near optimum, contained 50 N, 10 P, 50 K, 40 Ca, 15 Mg, 20 S, 0·93 Fe, p.p.m., and trace elements. The absolute requirements (measured by % content in needles at maximum growth) were greatest for N and least for Ca, and sensitivity to deviation from the optimum was similar. Requirements in respect of various elements were less than those of Birch and Pine. Percent contents at the onset of deficiency symptoms (all associated with chlorosis) are tabulated. Dry weights of stems and needles were strongly correlated. Root development was strongly affected by the nutrient factor.

1542. Ahromejko, A. I., and Šestakova, V. A. Izučenie roli mikroorganizmov v pogloščenii i vydelenii fosfora i sery sejancami duba, jasenja i klena. **[Investigations on the rôle of microorganisms in the uptake and release of P and S by Oak, Ash and Maple seedlings.]** *Mikrobiologija, Moskva* 27 (1), 1958 (67–74). 15 refs. [Russ.russ.e.] N.L.L.

A report of investigations made in 1954–55 on *Quercus robur*, *Fraxinus pennsylvanica* and *Acer platanoides* in sand or water cultures with P^{32} and S^{35} supplied in the rooting medium or, for the root-excretion experiments, via the leaves. During the period of active growth and reproduction, the microflora (chiefly *Pseudomonas* spp.) competed with the plants for nutrients; after death, the micro-organisms released rapidly-mineralized nutrients which became available to the plant roots. Dried and comminuted Maple leaves containing P^{32} were rapidly decomposed by the soil microflora, and considerable amounts of P^{32} were found after 30 days in the plants grown in this experiment. A parallel experiment with Oak leaves showed a slower rate of release, their high tannin content possibly hindering decomposition. Root excretions from the plants greatly stimulated proliferation of the micro-organisms. Addition of *Pseudomonas radiobacter* or *Azotobacter chroococcum* to water or sand cultures stimulated the excretion of P and S by the roots, and also influenced the diurnal cycle of root excretions, smoothing out the differences between minima and maxima.

1543. Hellmers, H., and Kelleher, J. M. ***Ceanothus leucodermis* and soil nitrogen in Southern California Mountains.** *For. Sci.* 5 (3), 1959 (275–7). 14 refs.

This study has shown that the soil improvement caused by *C. leucodermis* is partly due to an increase in available N. While *C. leucodermis* removed more N from the soil than was originally present, it left almost twice as much available N in the soil to be used by following crops.

1544. Giulimondi, G. Influenza di alcune anomalie strutturali del terreno sull' accrescimento del pioppo in vivaio. **[Effect of some anomalies of soil structure on the growth of Poplar in the nursery.]** *Pubbl. Cent. Sper. Agric. For., Roma* 2, 1959 (223–32 + 1 tbl.). 9 refs. [It.it.e.*e*.]

Experiments were made in ploughing a clay-loam soil at different moisture contents, before planting with young Poplars. It was found that the plants growing on plots ploughed (*a*) 2 days after watering at a rate of 100 litres/sq. m., (*b*) immediately after watering, soon showed signs of checked growth.

This proved to be related to reduced stability of aggregates and porosity in the ploughed horizons, and consequent compaction leading to a reduction in available N. Experiments were then made to try to remedy this condition by the application of $Ca(NO_3)_2$ with and without $FeSO_4$. Growth on the plot given both $Ca(NO_3)_2$ and $FeSO_4$ was significantly greater than on that given $Ca(NO_3)_2$ alone, though both showed great improvement. The experiments indicated that young Poplars are good indicators of structural anomalies in the soil.

1545. FRITZSCHE, K., and KEMMER, C. Über den Einfluss von Kalk auf Wachstum und Entwicklung von Pappelstecklingen unter besonderer Berücksichtigung des pH Wertes. **[The effect of Ca on growth and development of Poplar cuttings, with special reference to pH.]** *Wiss. Abh. Dtsch. Akad. LandwWiss., Berl.* No. 40 (*Beitr. Pappelforsch.* No. 3), 1959 (135–69 + 8 plates, 2 tbls.). 27 refs. [G.g.russ.e.]

Reports on laboratory trials in which the effect and interaction of pH, Ca as a nutrient (as distinct from its effect on pH), and various levels of other combined nutrients, were tested on *Populus* × *robusta* cuttings grown in solutions, though only with a few selected combinations of these factors. Full-strength nutrient solution without Ca at pH7 gave better growth than half-strength solution with Ca at pH 4·5. At pH 4·5, half-strength with Ca was superior to variants with $\frac{1}{10}$ strength and increased doses of Ca, though at the low level of nutrition additional Ca stimulated growth, particularly of roots. All series at pH 3 were failures. At low pH or low nutrition levels, changes in leaf venation [cf. *F.A.* 18 No. 3990], leaf shape, hairiness, and anthocyanin content etc. could be observed. Practical applications of the results to treatment of Poplars on spoil mounds are discussed.

1546. LIANI, A. Ulteriori indagini sui terreni coltivati ad eucalitti. I. Ricerche chimico-fisiche. **[Further investigations on soils under Eucalypts. I. Chemical and physical studies.]** *Pubbl. Cent. Sper. Agric. For., Roma* 2, 1959 (191–201 + 2 tbls.). 4 refs. [It.it.e.*e.*]

[Cf. *F.A.* 19 No. 1295.] A study was made of 8 profiles from a moderately calcareous sandy soil (pH 7·4–8·2) in Sicily—5 of them from under a 21-year-old Eucalypt shelterbelt (*a*), and controls from a neighbouring Pine wood (*b*) and arable fields (*c*). The accumulation of humus in (*a*) was higher than the mean of other Eucalypt stands previously studied (10·45 kg./sq. m.) and was particularly high in areas with an understorey of *Acacia saligna*, *Robinia pseudoacacia* and *Phragmites* sp. (20·33 kg./sq. m.); the figures for (*b*) and (*c*) were 7·54 and 2·92 respectively. No displacement of Fe_2O_3 or Ca was noted in the various profiles, as the $CaCO_3$ had prevented the evolution of the soil. Nevertheless, the decomposing litter gave an acid reaction, and the thin humus horizon beneath it had no Ca. In horizons A_1, A_2, and B, there was no increase of P or K in (*a*) compared with (*b*) and (*c*).

1547. FLORENZANO, G. Ulteriori indagini sui terreni coltivati ad eucalitti. II. Ricerche microbiologiche. **[Further investigations on soils under Eucalypts. II. Microbiological studies.]** *Pubbl. Cent. Sper. Agric. For., Roma* 2, 1959 (243–58). [It.it.e.*e.*]

Studies were made on the same sample profiles as those investigated for chemical and physical properties. Profiles under Eucalypts with no understorey (*a*1) were very rich in bacteria in the superficial (A_{00} and A_0) horizons, below which there was a sudden decrease in biological activity. Profiles under Eucalypts with an understorey of *Acacia saligna* and *Robinia pseudoacacia* (*a*2) had fewer bacteria but more fungi and actinomycetes, and no significant difference between superficial and lower horizons. In controls (arable fields (*c*)) the microflora (mainly bacterial) did not vary much with depth. There was a high % of nitrifying bacteria in all samples from (*a*1), (*a*2) and from under Pines (*b*), but not in (*c*). The processes of ammonification, nitrification and cellulolysis under (*a*1) were normal and differed little from those in (*c*); but in (*a*2) they were abnormal and inhibited, probably as a result of reciprocal action of the Eucalypts and the understorey plants within the rhizosphere.

181.35. Special Modes of Nutrition. Symbiotic Relationships. Parasitism

See also No. 1409.

1548. KARAVAEV, M. N. Azotfiksirujuščie klubenʹki na kornjah iskopaemoj olʹhi (*Alnus* sp.). **[Nitrogen-fixing nodules on the roots of fossil Alder (*Alnus* sp.).]** *Bot. Ž.* 44 (7), 1959 (1000–1). 3 refs. [Russ.]

A description of material found in Tertiary deposits in Yakutia.

1549. WORLEY, J. F., and HACSKAYLO, E. **The effect of available soil moisture on the mycorrhizal association of Virginia Pine.** *For. Sci.* 5 (3), 1959 (267–8). 5 refs.

A pot experiment was made to study the effect of controlled soil-moisture levels on the % of *Cenococcum graniforme* mycorrhizae on *Pinus virginiana*. The results indicate that this black fungus is more vigorous as a mycorrhizal fungus at a low soil moisture content than the white fungus that is the predominant mycorrhiza-former at a relatively high soil m.c.

1550. NEUMANN, R. **Relationships between *Pisolithus tinctorius* (Mich. ex Pers.) Coker et Couch. and *Eucalyptus camaldulensis* [*rostrata*] Dehn.** *Bull. Res. Coun. Israel* 7D (2), 1959 (116). 5 refs. [E.]

The fungus has always been found as a mantle enveloping the roots of *Eucalyptus*, particularly *E. rostrata*. Except in one case, no penetration of hyphae into the tree roots was observed, and the relationship appears to be at a rhizospheric rather than a mycorrhizal level. Eucalypt seedlings grew better in the presence of the fungus, and further experiments with radioactive I indicated that the fungus has the capability of transferring minerals from a medium into *Eucalyptus* tissues.

181.36. Root Relations and Root Development etc.

See also Nos. 1330, 1752–3, 1761, 1919.

1551. Peynado, A. **Devices for observing root growth and calipering tree trunks.** *Journal of the Rio Grande Horticultural Society, Westlaco, Tex.* 12, 1958 (61–6). 3 refs. E.M.B.

Describes the design and use of a glass-sided root-observation box sunk into the soil in an orchard for observing the root growth of fruit trees, and also a light-weight, long-handled caliper with a scale showing trunk diameter or b.a.

1552. Suzuki, H. **[Research concerning the root-system of the Nikko Avenue Cedars (*Cryptomeria japonica* D. Don.). I. On the horizontal root-system.]** *Bulletin of the College of Agriculture, Utsunomiya University, Japan* 3 (2), 1957 (84–97 + 42 photos). 5 refs. [Jap.e.*e.*] C.G.B.

Describes this long, 300-year-old avenue, now protected as both an historic and a nature monument, with special reference to the form of road and banks, and the peculiar entangled mass of horizontal roots the trees were compelled to develop in the restricted space at their disposal.

1553. **Root development and height growth of Red Pine in relation to soil conditions.** *Extr.* from *Rep. For. Res. Glendon Hall Fac. For. Univ. Toronto 1958/59*, 1959 (5).

A study was made of the root development and height growth of Red Pine, especially in plantations in S. Ontario. Relatively few roots occurred in sandy parent material, and it was concluded that this was due in most instances to unfavourable moisture conditions or physical barriers such as slightly compacted layers. The diameter of roots at a given age, and also their branching habit, seemed to give an indication of the moisture and nutrient status of the soil in which they grew. The pattern of height increment of these trees was studied. Annual height increment increased rapidly, but unevenly, for the first 10 years after planting and then decreased in varying degrees with increase in age. Variability in increment could be attributed in nearly all cases to changes in soil moisture.

1554. Kohno, N. A. O skorosti rosta kornej klena ostrolistnogo. **[On the rate of root growth of *Acer platanoides*.]** *Dokl. Akad. Nauk SSSR* 127 (2), 1959 (459–61). 2 refs. [Russ.] A.P.B.

Using Ladefoged's method [see *F.A.* 1 p. 157], the rate of root growth of a 10-year-old tree in an Oak/*Acer* plantation near Kiev on medium-podzolized grey clay-loam forest soil was measured at 10-day intervals from May to Sept. 1958. The growth rate of the roots depended primarily on soil moisture, and to a lesser extent on soil temperature. Growth was greatest in wet and least in dry periods. The best growth was observed in June, the month with the greatest height growth. In hot, dry weather the length increment of roots declined but considerable ramification took place. Results on the whole confirmed those of Morrow [see *F.A.* 12 No. 2845]. The mean length and volume increment of the tree's roots were calculated for the one growing season.

1555. Labunskij, I. M. Značenie kornevoj sistemy duba v stepnom lesorazvedenii. **[The importance of the root system of Oak in steppe forestry.]** *Vestn. sel'. hoz. Nauki, Moskva* 4 (3), 1959 (70–5). 4 refs. [Russ.e.g.f.] O.W.

Briefly reports results of work during 1944–58 in the Veliko-Anadol forest, on the relation between the drought resistance of Oak and the length of its tap-root. Ploughing and weeding increased the depth of root penetration considerably in young plantations and also their drought resistance. Oak, if suppressed by its associates (*Fraxinus americana* and especially *Acer platanoides*), did not develop a deep tap-root, and the laterals went no deeper than 2 m.

1556. Gerasimenko, P. I. O vzaimovlijanii kornevyh sistem dubkov i derev'ev soputstvujuščih lesnyh porod. **[The interaction of the root systems of young Oaks and associated forest tree species.]** *Agrobiologija* 1959 (2), (247–51). [Russ.] I.M.I.

Gives tabulated data on the distribution of roots by sizes for young Oak (nest-, spot-, and row-sown) in the Belgorod-Don State Shelterbelt on chernozems, and of the mean weights of the plants from the different methods of sowing. The root distribution of six common associates of Oak in the shelterbelt is shown, and drawings presented of the interrelationships of the roots of Oak and its associates.

1557. Romanov, A. A. O vzaimootnošenijah drevesnyh i kustarnikovyh porod v zaščitnyh lesonasaždenijah. **[The interrelationships of trees and shrubs in shelterbelts.]** *Agrobiologija* 1959 (2), (252–7). [Russ.russ.] I.M.I.

Investigations were made on the interrelationships of the aerial and root systems of trees and shrubs (particularly with regard to root competition for soil moisture) in shelterbelts growing mainly on dark-chestnut soils in the Rostov region. In Oak (*Quercus robur*)/*Pyrus malus*, Oak/Pear [*P. communis*?], and Oak/*Acer tataricum* belts, the disposition of the root systems was such that there was no significant root competition between the Oak and the other species; in Oak/*Fraxinus excelsior*, and Oak/*Caragana arborescens*/*Robinia pseudoacacia* belts, the roots of the associated species competed directly with the Oak, suppressing or killing it completely, especially in the pole stage when in equal mixture with the Oak.

1558. Armson, K. A., and Driessche, R. van den. **Natural root grafts in Red Pine (*Pinus resinosa* Ait.).** *For. Chron.* 35 (3), 1959 (232–41). 10 refs.

The occurrence of root grafts was investigated in 9 plantations 5–45 years old, all originally planted at 6 × 6 ft. spacing. No grafts were found between trees < 15 years old, but grafts were common in all stands $\geqslant 15$ years. Most of them occurred at 4–14 in. below the soil surface. Grafts appeared to occur slightly more frequently in thinned than in unthinned stands. There was little evidence that numbers of grafts increased with age of stand. It was concluded that when two roots graft, that of smaller diameter and/or having the greater length between graft and tree, receives a net increase in its food supply at the graft. *From authors' abstract.*

1559. Bormann, F. H., and Graham, B. F., Jr. **The occurrence of natural root grafting in Eastern White Pine, *Pinus strobus* L., and its ecological implications.** *Ecology* 40 (4), 1959 (677–91). 29 refs.

A study of intraspecific root grafting was made, a technique for detecting root grafts by a tracer method being developed and described. The major findings were: (*a*) Root grafting occurs in White Pine stands from 15 to 71 years of age, and probably in both younger and older stands. (*b*) It occurs under a wide range of site conditions from bogs to dry sites. (*c*) Fusion may be limited to a single graft between trees, but often sizable clusters of trees are organically united by an extensive complex of self- and intraspecific grafts. (*d*) The degree of grafting in any stand is probably related to its age, density, purity, and particular ecotype. (*e*) Roots of seemingly dead trees often remain alive through grafts with living trees. This kind of multigenotypic entity is apparently common in many Pine communities. (*f*) Many grafts are functional in the translocation of food, minerals, and water. Translocation of food was evidenced by the maintenance of growth in old living stumps, and translocation of water and minerals by the movement of dye and radio-isotopes from tree to tree, from freshly cut stumps to trees, and from old living stumps to trees. (*g*) Other grafts may not function in translocation, as shown by the failure of dye to move from cut stumps to adjacent trees known to be grafted to the stump. It is suggested that in some instances grafted trees may behave as parts of an organic union rather than as individuals in competition with each other. The number of reports of natural root grafting in many forest tree species suggests that the observations here reported and their ecological implications are not limited to White Pine. [Cf. *F.A.* 14 No. 3033.] *From authors' summary.*

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See also Nos. 1532, 1555–7, 1608, 1615, 1935–6, 1947.

1560. Rogers, D. J. **Some effects of fire in southern Wisconsin woodlots.** *For. Res. Note Wis. Coll. Agric.* No. 51, 1959. pp. 2. 2 refs.

Study of two adjacent 30-year stands originating in coppice regrowth after clear-felling, one of which had been burnt 5 years before the study, showed little effect on the older trees, but a striking change in number and species composition of saplings. In this respect all species showed a considerable reduction, except White Oak (*Quercus alba*), which had increased from 23 to 31 per acre.

181.5. Reproductive Behaviour

See also Nos. 1431–2, 1440–1, 1448, 1461–3, 1476, 1528, 1639 *et seq.*

1561. Harris, B. J., and Baker, H. G. **Pollination of flowers by bats.** *Nigerian Field* 24 (4), 1959 (151–9).

Observations have been made on bats visiting *Parkia clappertoniana*, *Ceiba pentandra*, *Kigelia africana* and *Adansonia digitata*.

1562. **Pollination mechanism [of Wattle].** *Extr.* from *Rep. Wattle Res. Inst. S. Afr. 1958/59*, 1959 (22–3).

In order to determine the effect of isolating Wattle [*Acacia mollissima* and *A. irrorata*] inflorescences from large insects (especially bees), but not from wind-carried pollen, inflorescences were set in cages of nylon gauze with a mesh of 2·7 × 2·3 mm. which let ca. half the wind-borne pollen grains through. Results indicate that exclusion of large insects forms a fairly effective barrier to cross-pollination.

1563. Pozzera, G. Rapporti fra produzione di strobili in *Pinus pinea* L. ed andamento stagionale. **[Relations between cone production by *P. pinea* and certain meteorological factors.]** *Ital. for. mont.* 14 (5), 1959 (196–206). 17 refs. [It.it.f.]

A study of the annual variations in cone production of an even-aged *Pinus pinea* stand in Tuscany confirmed that mast years are spaced out, but at fairly frequent intervals (3–4, or sometimes 5–6 years), and that production is always partial in the intervals. In mast years, all trees in the stand produced more cones. A significant positive correlation was found between the rainfall in March of one year and cone production in the autumn of the third year. Pollination of the ♀ gametophyte was not significantly influenced by rainfall during the flowering period.

1564. Watanabe, S. **[Silvicultural studies on Kusu (*Cinnamomum camphora* Sieb.) IV. The growth of saplings of Kusu during the period starting from the germination of its seeds to the end of its activity of the year.]** *Misc. Inform. Tokyo Univ. For.* No. 12, 1957 (79–94 + 3 gphs.). 14 refs. [Jap.jap.e.]

Traces the relative development of root, stem, branches and leaves. Root growth started 10–13 days before surface emergence. Aerial parts grew fastest from the middle to the end of September; roots at the beginning of growth (mid-June) and towards the end of July. Leaf production ceased towards the end of September, leaf-area growth and elongation of stem and branches in mid-November, stem diameter at the end of November, and root growth ca. mid-December. The root/shoot length ratio varied from 6/1 at the period of greatest root growth to 2/1 at the end of the growing period; the dry weight ratio from 2/1 in early July to ca. 0·6/1 towards the end of September. [Cf. *F.A.* 17 No. 2700; 21 Nos. 226–31.]

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 1450, 1553, 1571, 1635–6, 1787, 2208–9, 2373.

1565. Nishimura, S. **[On the characters of *Sequoia sempervirens* seedlings obtained from seed introduced from California (2).]** *Repr.* from *Japanese Journal of Breeding, Tokyo* 8, 1959 (227–32). 18 refs. [Jap.jap.e.*e*.]

Branch characters, including spacing, angle, and number of minor branches, were studied statistically for 12 individuals 3–4 years old. [Cf. *F.A.* 21 No. 1662.]

1566. MEYER, H. Der Einfluss von Kronenkürzungen an Fichten der II. Altersklasse auf deren Höhen- und Stärkenwachstum. **[The effect of removing parts of the crowns of Spruce of age class II [20-40 years] on height and diameter increment.]** *Arch. Forstw.* 8 (9), 1959 (812–49). 30 refs. [G.g.e.russ.]

In 5 trial plots [cf. *F.A.* 18 No. 1968] 14·3, 20, 40, or 60% of the length of live crowns, representing 15, 25, 55 and 80% of fresh weight of needle-bearing twigs, were removed from 1320 sample trees, total mean weights of needles and twigs on 233 dominant stems varying from 8·1 kg. at age 20 (mean crown length 4·5 m.) to 20·4 kg. (crown length 7 m.) of which 20–30% was shade material. Preliminary results after 5 years indicated no marked differences in height growth. For removals of ⩽ 20%, d.b.h. increment over the period increased slightly on two good sites and decreased slightly on the others, but with removals of > 20% it decreased progressively. The findings are thought to confirm a suggestion by Burger [cf. *F.A.* 1 p. 300–1] that the shade crown may be removed without materially affecting increment.

1567. SAYA, I. Ferite su fusto di *Ailanthus glandulosa* Desf. e reazioni di gemme dormienti. **[The reaction of dormant buds of *A. altissima* to wounds on the stem.]** *Nuovo G. bot. ital.* (*n.s.*) 64 (4), 1957 (1958), (680–2). 1 ref. [It.] A.P.B.

Dormant buds situated immediately below wounds (removing bark and cambium) were stimulated to develop, while those immediately above a wound remained dormant.

181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

See also No. 1432.

1568. ZIELIŃSKI, T. Świętokrzyski dąb "Bartek". **["Bartek"[—a veteran] Oak in the Świętokrzyski Mts.]** *Sylwan* 103 (11), 1959 (15–20 + 5 plates). [Pol.russ.e.]

Describes a giant Oak, ca. 1000 years old. In 1829 its volume (stem + branches) was 68·08 cu. m.; in 1959 it is estimated at 85 cu. m.

181.8. Phenology

See also Nos. 1433, 1436, 1440, 1457, 1473, 1481, 1487, 1529–30, 1533.

1569. GERHOLD, H. D. **Seasonal discoloration of Scotch Pine in relation to microclimatic factors.** *For. Sci.* 5 (4), 1959 (333–43). 44 refs.

Reviews the fairly extensive literature on the autumn discoloration of *Pinus sylvestris*, and describes a study made to measure quantitatively the effects of several environmental factors and to determine their influence on the process. These factors—light intensity and quality, temperature, relative humidity (r.h.), and day-length—were artificially altered, singly or in pairs, the resulting needle colours, measured against Munsell Colour Charts, indicating significant relationships with all the factors except r.h. The physiological processes occurring when the Pine becomes dormant were apparently closely related to discoloration. This occurred earlier as a result of premature short day-lengths, while extended day-lengths prolonged green needle colour into December despite freezing temperatures. Protection against freezing also retarded discoloration, and temperatures > 60° F. virtually eliminated it. Short photoperiods and low temperatures may apparently cause discoloration by: (1) reducing the chlorophyll synthesis rate; (2) exposing chlorophyll to decomposition by plant acids, through the disruption of chloroplasts and protoplasm; and (3) making chlorophyll susceptible to photautoxidation due to inhibition of photosynthesis. The yellow "protective coloration" of certain *P. sylvestris* races in winter is considered rather as a side effect of physiological processes facilitating winter survival, than as a means of genetic survival, since the author found no evidence of beneficial effects due to lower chlorophyll content.

1570. MOGGI, G. Ricerche fenologiche sopra alcune specie di eucalitti. **[Phenological research on some species of Eucalypt.]** *Pubbl. Cent. Sper. Agric. For., Roma* 2, 1958 (1959), (43–58 + 1 plate). 3 refs. [It.it.e.*e.*]

Observations were made in 1954–56 on the flowering and fruiting of 6 species of Eucalypt (*Eucalyptus rostrata*, *E. tereticornis*, *E. resinifera*, *E. rudis*, *E. botryoides* and *E. gomphocephala*) in the Pontine Marshes, and of two (*E. rostrata* and *E. globulus*) near Rome. Results are shown in tables and graphs with English captions. The observations were cut short by the very low temperatures in Feb. 1956, which badly damaged the plants under study.

1571. KORIBA, K. **On the periodicity of tree-growth in the tropics, with reference to the mode of branching, the leaf-fall, and the formation of the resting bud.** *Gdns'. Bull.* 17 (1), 1958 (11–81). 56 refs.

In the tropics of uniform climate there are, in tree growth, various transitions from the evergrowing to the deciduous, so that it is not enough to classify trees simply as evergreen or deciduous as in temperate regions. The author distinguishes four main classes: (1) evergrowing trees in which leafing is continuous, with the growing bud at the apex of the twig, and leaf size and length of internode are uniform; (2) intermittently growing trees in which leafing is seasonal, contemporary [weather-conditioned?], or non-seasonal [irregular], a resting bud forms on the shoot apex at the end of each growth period, and leaf size and length of internode are variable; (3) trees of 'manifold' growth [i.e. showing a different growth-rhythm in different parts]; (4) deciduous trees, which in fact represent a special case of (2). Four categories of flowering can also be distinguished. In Malaya, (1) and (3) together comprise ca. 20% of indigenous tree species, and (4) ca. 5%, the rest belonging to class (2). Deciduous trees are distributed fairly evenly in various dicotyledonous families, most of which include evergreen and intermittent species as well. The deciduous habit appears to be unrelated to aridity or humidity of habitat or to height of crown. Intermittent growth, whether evergreen or deciduous, is usually accompanied by the formation of a resting bud, but the two processes are not always carried on to the same degree, and in a favourable climate the latter is more easily modified than the former. The formation of leaf scales may be attributed to growth-regulator activities. Similarly the formation of the abscission layer, the length of periodic activity, and many other characteristics of trees are all controlled internally and show even clonal differences. This is especially evident in a uniform climate like Singapore's, where various growth habits are displayed without restriction, whereas in temperate or monsoon regions the external control predominates. [An appendix gives tabulated data on periodicity of growth for some hundreds of species.] *From author's summary.*

181.9. Miscellaneous (Including the Ecological Rôle after Death of Plants or Parts of Plants)

See No. 1854.

182. Synecology, Plant Sociology: General, Principles and Methods

182.1. Palaeoecology. History of Vegetation. Pollen Analysis

1572. MARTIN, P. S. **How many logs make a forest?** *Ohio J. Sci.* 59 (4), 1959 (221–2). 9 refs. C.G.B.

Discusses the evidence supplied by abundant broken logs embedded in glacial till, when attempting to identify the nature of pre-glacial vegetation.

1573. ČVANČARA, R., KRIESL, A., and SAMEK, V. Příspěvek k vývoji lesů na Červenojanovicku. **[The development of the forests at Červené Janovice.]** *Sbornik Vědeckých Prací Fakulty Lesnické, České Vysoké Učení Technické, Praha* No. 1, 1958 (7–20 + 1 map). 8 refs. [Cz.russ.g.*russ.g.*]

Discusses the history of the forests, using pollen diagrams, up to the 19th century. Present changes in stand composition, especially the increase of Spruce and Pine, are discussed; the reintroduction of Silver Fir is regarded as the most important object of management.

1574. DĄBROWSKI, M. J. Późnoglacjalna i holoceńska historia lasów Puszczy Białowieskiej. Część I. Białowieski Park Narodowy. **[Late glacial and Holocene history of Białowieża virgin forest. Part I. Białowieża National Park.]** *Acta Soc. Bot. Polon.* 28 (2), 1959 (197–248 + 2 dgms.). 61 refs. [Pol.e.] O.B.D.

1575. ARTJUŠENKO, A. T. Rastitel′nost′ Allereda na territorii Russkoj ravniny v svjazi s obščem razvitiem rastitel′nogo pokrova v pozdnelednikov′e v Vostočnoj i Srednej Evrope. **[The Alleröd vegetation of the Russian plain, in connexion with the general development of vegetation in the post-glacial period in E. and Central Europe.]** *Bot. Ž.* 44 (6), 1959 (772–85 + 4 dgms.). 74 refs. [Russ.e.]

A review, with original observations based on pollen diagrams, and referring mainly to the W. Ukrainian Poles′e.

1576. ŠERCELJ, A. Prispevek k zgodovini naših gozdov. **[On the history of Slovenian forests.]** *Gozd. Vestn.* 17 (7/8), 1959 (193–203). [Sloven.g.]

Sketches their history, with the aid of pollen diagrams. All the main points are contained in the German summary.

1577. MILI, S. **Pinaceae of Japan, with special reference to its remains.** *Journal of the Institute of Polytechnics, Osaka City University, Osaka (Ser. D.)* No. 8, 1957 (221–91). [E.?] From *abstr.* in *Biol. Abstr.* 34 (4) 1959 (No. 11213).

Eight genera (34 spp.) of post-Pliocene fossil Pinaceae have been found in Japan; 2 genera and 14 spp. are extinct. *Abies firma, Pinus densiflora, P. thunbergii* and *Tsuga sieboldii* have persisted from the Pliocene to the present time but are usually absent from the Pleistocene glacial stages. *Abies sachalinensis, A. veitchii, Picea bicolor, P. jezoensis, Larix gmelinii, Pinus koraiensis* and *Tsuga diversifolia* are found only in glacial periods, when their distribution was wider and they lived at lower altitudes than their present representatives, which are now limited to small areas in Hokkaido.

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 1391–2, 1402, 1601, 1608, 1615, 1782, 2611.

1578. PASSARGE, H. Über Kahlschlaggesellschaften im baltischen Buchenwald von Dargun. **[Plant communities on clear fellings in the Baltic Beechwood of Dargun [E. Mecklenburg].]** *Phyton, Annales Rei botanicae, Horn* 7 (1/3), 1957 (142–51). 4 refs. [G.g.] L.S.

A plant-sociological study, distinguishing communities on rich peaty soils in the *Alneto-Ulmion*, on loamy soils in the richer facies of the Baltic Beech forest (two stages) and on sandy soils, now largely in Pine and Spruce forests (also two stages), and stressing their floristic and plant-sociological affinity to forest rather than ruderal communities.

1579. TILEV, G. Za smjanata na smărča ot elata. **[Replacement of Spruce by Silver Fir.]** *Gorsko Stopanstvo* 15 (8), 1959 (11–5). [Bulg.]

Tabulates data on the %s of Spruce and Fir regeneration under mixed stands of various ages, in a forest area at 1200–1500 m. alt. in Bulgaria. Fir regeneration predominated, and the reasons for this are discussed.

1580. FLACCUS, E. **Revegetation of landslides in the White Mountains of New Hampshire.** *Ecology* 40 (4), 1959 (692–703). 17 refs.

Vegetation was sampled on 29 landslides 9, 19, 30, 60, and 72 years old. Herb and shrub layers were relatively minor on deposit areas. *Betula papyrifera, B. lutea, Prunus pennsylvanica* and *Populus tremuloides* come in immediately and rapidly develop a thicket. Soil analyses of the top 4 in. showed a build-up of organic matter and exchangeable Ca, Mg, and K to levels comparable with those of surrounding forest.

1581. IWAKI, H., and TOTSUKA, T. **Ecological and physiological studies on the vegetation of Mt. Shimagare II. On the crescent-shaped "dead trees strips" in the Yatsugatake and the Chichibu Mountains.** *Bot. Mag., Tokyo* 72 (852), 1959 (255–60). 4 refs. [E.e.jap.] I.M.I.

[Cf. *F.A.* 20 No. 2978.] Describes the long strips of dead trees of *Abies veitchii* and *A. mariesii*, occurring on S. aspects at 2100–2500 m. alt., and probably due to a combination of strong winds and insolation. The crescent-shaped areas of dead trees that also occur, develop in time into long strips, and a theory of the process involved is put forward.

182.4. Layer Communities

See also Nos. 1531, 1584, 1588, 1600, 1616.

1582. MAISENHELDER, L. C. **Understory plants of bottomland forests.** *Occ. Pap. Sth. For. Exp. Sta.* No. 165, 1958. pp. 40. 11 refs.

An illustrated description of 36 important species (2 grasses, 9 forbs, 13 climbers and 12 shrubs or small trees) with special attention to the Mississippi Delta, discussing site preference, range, silvicultural importance (damage to reproduction or trees, forage value etc.) and control where necessary.

182.5. Synecological Measurements and Methods

1583. HEADY, H. F., GIBBENS, R. P., and POWELL, R. W. **A comparison of the charting, line intercept, and line point methods of sampling shrub types of vegetation.** *Repr.* from *Journal of Range Management, Portland* 12 (4), 1959 (180–8). 24 refs.

A comparison was made, for accuracy and practicability, of charting, line intercept, and line point in sampling two shrub communities. All three methods gave reliable estimates of the population mean, but the transect methods gave less variable data and required fewer plots. Of the two latter, the line-point method was quicker.

182.8. Ecology of Artificial (Cultivated) Plant Communities etc.

1584. NICENKO, A. A. Lindulovskaja listvenničnaja rošča (*Larix sukaczewii* Dyl.). Geobotaničeskoe issledovanie. **[The *L. sukaczewii* stand at Lindulovo [Karelian Isthmus]. A geobotanical investigation.]** *Bot. Ž.* 44 (9), 1959 (1249–60). 24 refs. [Russ.e.]

The plantation, established in 1738, has almost no natural regeneration. Data are tabulated on the soil, stand density and composition, dimensions of the trees, and on the herbaceous species present, for each of the five types of plant community recognized in the stand. The soil has changed from podzolic to a sod type, and the herbaceous cover has become more typically mesophytic with an abundance of nemoral species. The resemblance of this stand to some types of natural *Lariceta*, and the ecological history of Larch and its associated species, are discussed.

187. Vegetation Types

See also Nos. 1325, 1333, 1344, 1391, 1451, 1521, 1531, 1578, 1620, 1625, 2596, 2611.

1585. MAYER, H. Waldgesellschaften der Berchtesgadener Kalkalpen. **[Forest plant communities of the Kalkalpen [calcareous ranges of the Alps] near Berchtesgaden.]** *Mitt. StForstverw. Bayerns* No. 30, 1959 (163–216 + 1 tbl.). 39 refs. [G.]

A plant-sociological study, distinguishing 3 main types (mixed hardwoods) in the submontane zone, 8 hardwood, 6 coniferous and 4 dwarf types in the montane, and 5 coniferous and 5 dwarf types in the subalpine zones, with Spruce/Fir/Beech communities (*Abieto-Fagetum*) the most widely distributed.

1586. NEUHÄUSL, R. Die ostsudetischen krautreichen Buchenwälder und ihre Beziehungen zum *Fagetum boreoatlanticum*. **[The E. Sudeten Beech forests with a field layer rich in herbaceous species, and their relation to the *F. boreoatlanticum*.]** *Preslia* 31 (4), 1959 (385–93). 17 refs. [G.] E.M.B.

Describes the *Abieto-Fagetum sudeticum* (montane variant), its characteristic features, and the differences between it and the *F. boreoatlanticum*.

1587. FERRARINI, E. Flora e vegetazione dei castagneti e dei cerreti dell'alta valle del Taverone (Alta Lunigiana). **[The flora and vegetation of Chestnut and *Quercus cerris* stands of the upper Taverone valley (upper Lunigiana valley).]** *Nuovo G. bot. ital. (n.s.)* 64 (4), 1957 (1958), (485–640 + 1 map). 71 refs. [It.it.e.] A.P.B.

The study covers floristic composition, distribution, phenology, and palaeoecology.

1588. PONTIERI, L. La cerreta di Pietra Palomba sulla riva sinistra dell' Ofanto presso Monteverde. **[The *Quercus cerris* stand of Pietra Palomba on the left bank of the river Ofanto near Monteverde.]** *Nuovo G. bot. ital. (n.s.)* 65 (3), 1958 (1959), (425–51 + 2 tbls.). 21 refs. [It.it.e.] A.P.B.

A statistical study of the vegetation under Oak coppice and in clearings, with notes on the relative abundance and dominance of species collected.

1589. JEDLOWSKI, E. Panorama forestale del Monte Pollino. **[A silvicultural view of Monte Pollino.]** *Monti e Boschi* 10 (10), 1959 (499–513). [It.f.e.]

Describes the forest zones of this massif on the borders of Calabria and Basilicata (main forest types pure Beech and mixed Beech/Silver-Fir, with *Quercus cerris* and *Q. ilex* on the lower slopes). On the higher slopes there occurs a stand (115 ha.) of *Pinus heldreichii* var. *leucodermis*, described in some detail.

1590. ROVINETTI, F. Profilo fitogeografico del Monte Ortobene (Nuovo-Sardegna). **[Phytogeographical profile of Monte Ortobene, Sardinia.]** *Nuovo G. bot. ital. (n.s.)* 64 (3), 1957 (431–54). 28 refs. [It.it.e.] A.P.B.

Among the types occurring on this granitic mountain (mainly covered with garigue), is a mixed *Quercus ilex*/*Q. lanuginosa* wood on the lower N.W. slope, becoming pure *Q. ilex* at higher altitudes.

1591. LAPRAZ, G. Note sur les forêts de *Pinus silvestris* des environs de Bagà (Pyrénées Catalanes). **[The *P. sylvestris* forests around Bagà (Catalonian Pyrenees).]** *Collectanea Botanica, Barcelona* 5 (2), 1957 (405–12). [F.] L.S.

The results are given of an ecological survey of these forests, which are mainly the result of degradation by over-exploitation of the *Quercus pubescens* climax forests.

1592. BOLÓS, O. DE. Datos sobre la vegetación de la vertiente septentrional de los Pirineos: observaciones acerca de la zonación altitudinal en el valle de Aran. **[The vegetation of the northern slopes of the Pyrenees: the altitudinal zonation in the valley of Aran.]** *Collectanea Botanica, Barcelona* 5 (2), 1957 (466–514). 33 refs. [Span.] L.S.

Presents a detailed ecological survey of the two lower altitudinal stages, (1) *Isopyreto/Quercetum roboris* (*Fraxino-Carpinion*) and (2) *Fageto/Scilletum* (*Fagion*).

1593. LAPRAZ, G. Aperçu sur la végétation d'El Miracle (Catalogne). **[The vegetation of El Miracle, Catalonia.]** *Collectanea Botanica, Barcelona* 5 (2), 1957 (387–404). [F.f.] L.S.

An ecological study of the vegetation suggests that the present forests of *Pinus clusiana* subsp. *salzmanni* [*P. nigra* var. *cebennensis*] are the result of human interference, the original Oak forests having almost entirely disappeared. Great caution in exploitation must be exercised, and particular care must be taken to avoid or arrest the development of xerophytic associations, which can only be colonized with difficulty by *P. nigra* var. *cebennensis*.

1594. BRAUN-BLANQUET, J., and FUKAREK, P. Contribution à la connaissance des forêts méditerranéo-montagnardes: La Forêt de *Pinus salzmanni* de Saint-Guilhem-le-Désert. **[Mountain forests of the Mediterranean: the *P. nigra* var. *cebennensis* forest of Saint-Guilhem-le-Désert.]** *Collectanea Botanica, Barcelona* 4 (3), 1955 (435–88 + 7 photos + 2 tbls.). 16 refs. [F.] L.S.

The Pine forest of Saint-Guilhem-le-Désert comprises two distinct associations. At the lower levels and on its southern aspect it belongs to the *Rosmarineto-Lithospermetum dolomiticum* evolving towards the *Quercetum ilicis galloprovinciale*. At the higher levels and on its northern aspect is found a *Pinus nigra* var. *cebennensis* sub-association of the *Querceto-Buxetum*. The evolution towards the climaxes is extremely slow. The forest is of Tertiary origin and a relict of an extensive forest which, during the Quaternary, extended as far as the approaches to Montpellier and Marseilles. These relicts have an undoubted value in the maintenance of vegetative cover and conservation of the soil. It is suggested that *P. nigra* var. *cebennensis* should be introduced in areas where the existence of *Rosmarineto-Lithospermetum dolomiticum* indicates an advanced stage in the degradation of soils and vegetation. Higher up, and with favourable soil conditions, species of the *Querceto-Buxetum* may be added in order to diminish the threat of fire. *Sorbus domestica*, *S. aria*, *Acer monspessulanum*, *A. opalus* and *Quercus pubescens* are suggested. *Ostrya carpinifolia* and *Fraxinus ornus* could also be introduced where the soils are not too shallow.

1595. BRAUN-BLANQUET, J. Zur Vegetation der nord-bündnerischen Föhrentäler. **[The vegetation of the northern Grisons Pine valleys.]** *Vegetatio* 8 (4), 1959 (235–49 + 2 tbls.). [G.] A.P.B.

A floristic study listing species found in the *Ononido/Pinetum*, the *Querceto/Lithospermetum emeretosum* and the *Xerobrometum rhaeticum*.

1596. MEZERA, A. Korelace mezi vlastnostmi stanovišť a fytocenos a mezi růstem a přírůstem dřevin v jihomoravských lužních lesích. **[The correlation between site factors and the phytocoenosis, and between development and increment in the S. Moravian floodplain forests.]** *Sbornik Vědeckých Prací Fakulty Lesnické, České Vysoké Učení Technické, Praha* No. 1, 1958 (45–76). [Cz. russ.g.]

Distinguishes four types of stand according to the water-table. Height and d.b.h. of mean stems of Ash, Oak, Poplar (4 spp.), Alder, and Elm (2 spp.) were determined and compared. Many conclusions were drawn on the silviculture and management of these forests, especially on increment on various sites; Oak, the proportion of which should be increased, requires a rotation of ca. 120 years. General yield tables are inadequate for all species in these flood-plain growth conditions.

1597. KÁRPÁTI, I., and PÉCSI, M. **Correlations between the succession of natural groves and the flood-plain levels on the great Hungarian plain.** *Abstr.* in *Acta biol., Budapest: Suppl.* No. 3, 1959 (24–5). [E.] O.R.S.

The various flood-plain levels can be distinguished by varying plant associations; e.g. *Nanocyperion*, *Salicetum triandrae*, *Salicetum purpureae* and *Salicetum albae-fragilis* occur on the lower levels subject to frequent flooding, and subassociations of *Querceto-Ulmetum hungaricum* on higher levels where flooding is rare.

1598. PISKERNIK, M. Gozdne združbe v spodnji stopnji slovenskega Visokega Krasa in fitosociološki sistem. **[Forest associations in the lower montane stage of the Slovenian High Karst, and the phytosociological system.]** *Gozd. Vestn.* 17 (1/2), 1959 (1–21). 10 refs. [Sloven.g.]

1599. YALTIRIK, F. Güney Amanoslarda floristik müşahedeler. **[Floristic observations in the S. Amanos Mts.]** *Istanbul Üniv. Orm. Fak. Derg.* 8*A* (2), 1958 (199–210). 12 refs. [Turk.e.*e*.]

Describes the areas of *Buxus longifolia*, with floristic and meteorological data, and also the presence of *Prunus laurocerasus*, a species of the Colchian flora hitherto unreported in the Mediterranean region. The reasons for the decreasing area of Box (felling for making combs, etc. and using parts of the plant as medicines) are discussed.

1600. KIL'DJUŠEVSKIJ, I. D. O nekotoryh zakonomernostjah struktury rastitel'nogo pokrova vostočnogo sklona pripoljarnogo Urala. **[Some regular features in the structure of the vegetation on**

the E. slopes of the sub-arctic Urals.] *Bot. Ž.* 44 (7), 1959 (929–42). 26 refs. [Russ.e.]

Divides the synusia of the region into three main groups: (1) trees and shrubs, (2) grasses and shrubs, (3) the ground layer (i.e. mosses and lichens), and on this basis presents a tabular form for recording and classifying the vegetation, and symbols for the groups recognized, for use on maps and profile diagrams. The advantages of viewing plant associations as combinations of synusia are discussed.

1601. PARMUZIN, JU. P. Inversija lesnoj rastitel′nosti v gorah Putorana. **[Inversion of forest vegetation in the Putorana Mts. [N. central Siberia].]** *Bot. Ž.* 44 (9), 1959 (1303–7). [Russ.]

In these mountains the usual three vertical zones are: (1) montane polar desert, (2) montane tundra, and (3) open woodland and forest (mainly *Larix gmelinii*). A case of inversion is described, in which the growth density and species composition of the forest were better on the higher slopes, with poor woodland below. The better conditions at the higher levels are thought to be due to additional nutrient supplies brought to this zone in the surface and sub-surface run-off from the unforested slopes above.

1602. PETROV, M. P. Botaničeskie issledovanija v severnoj časti central′nogo Kitaja. **[Botanical investigations in the N. part of Central China.]** *Bot. Ž.* 44 (8), 1959 (1198–212). 7 refs. [Russ.]

Describes the vegetation types (including the broadleaved forest type containing elements of coniferous forests, and the forest-steppe shrub type), and their distribution, as observed in a 1957 expedition to study the possibilities of erosion control in the middle reaches of the Hwang Ho (mainly in Inner Mongolia, but also in Kansu and Shensi Provinces).

1603. POLJANSKIJ, V. I. V jugozapadnoj Jun′nani. **[In S.W. Yunnan.]** *Priroda, Moskva* 48 (9), 1959 (77–82). [Russ.] A.P.B.

A popular account of the vegetation of the area mentioning, in addition to the tropical rain forest [cf. *F.A.* 20 No. 1620], the virtually virgin 'dragon forest' of conifers and evergreen broadleaved species around a temple near Kunming.

1604. CHAUDHURI, A. B. **Grasses and grassland types of the Central Forest Division, West Bengal.** *Indian For.* 85 (10), 1959 (603–6).

1605. AGARWHAL, S. C. **Grasslands of Chakrata Forest Division, District Dehra Dun.** *Indian For.* 85 (11), 1959 (659–62). 6 refs.

Four zones—subtropical, temperate, subalpine, and alpine—are distinguished and described, including brief notes on the associated forest flora.

1606. SHANKARNARAYAN, K. A., and DABHOLKAR, M. V. **Studies on the vegetation of Salem district [S. India].** *Indian For.* 85 (10), 1959 (577–80 + 6 photos). 3 refs.

The situation, topography, geology and climate of Salem district are presented. Based on Champion's classification the following types are met with, viz. (1) southern thorn forest, (2) southern dry deciduous, (3) southern dry evergreen, and (4) southern evergreen. Type (1) comprises two subtypes, namely: (*a*) *Acacia/Pterolobium* and (*b*) *Albizzia/Chloroxylon*. In (2) are subtypes of *Anogeissus* and *Shorea talura*; (3) mainly consists of *Hardwickia binata*; (4) is predominantly a *Syzygium/Wendlandia* type. The floristic composition of each type and subtype is presented in detail. *From authors' summary.*

1607. KEAY, R. W. J. **Vegetation map of Africa South of the Tropic of Cancer. Explanatory Notes.** Oxford University Press, London. 1959. pp. 24 + map. 265 refs. [E.F.] Price 15*s*.

The map is on a scale of 1 : 10,000,000. The types mapped (with notes) are: montane evergreen forest, temperate and subtropical evergreen forest, montane communities (undifferentiated), montane communities with afro-alpine communities, montane grassland, temperate and subtropical grassland, moist forest at low and medium altitudes, forest-savanna mosaic, coastal forest-savanna mosaic, dry deciduous forest, and a number of more local types. The map is published on behalf of A.E.T.F.A.T., with the assistance of UNESCO.

1608. AUBRÉVILLE, A. Les fourrés alignés et les savanes à termitières buissonnantes des plaines de Winneba et d'Accra (Ghana). **[The strips of thicket and the savanna with bush-covered termite mounds of the plains of Winneba and Accra (Ghana).]** *Bois For. Trop.* No. 67, 1959 (21–4). [F.]

Describes these curious formations observed from the air—discontinuous, parallel lines of thicket and regularly distributed bush-covered termite mounds on these otherwise treeless coastal plains. The lines make an acute angle with the coast and it is suggested that they represent the eroded remains of former woody vegetation that has mostly been destroyed by bush fires fanned by the prevailing S.W. winds. The woody vegetation on the termite mounds is presumed to have escaped by its slight elevation above the grass fires.

1609. SILLANS, R. Les savanes de l'Afrique Centrale. Essai sur la physionomie, la structure et le dynamisme des formations végétales ligneuses des régions sèches de la République Centrafricaine. **[The savannas of Central Africa. The physiognomy, structure, and dynamics of the woody plant formations of the arid regions of Ubangi-Shari.]** *Encyclopédie biologique, Paris* 55, 1958 (1–423). [F.] From *abstr.* in *Biol. Abstr.* 34 (3), 1959 (No. 6442).

A comprehensive, illustrated account of the general ecology of the region, followed by a detailed account of the woody vegetation of the savannas, and the origin of savanna formations.

1610. TRAPNELL, C. G. **Ecology. Climatic types of vegetation in Southern Kenya.** *Extr.* from *Rep. E. Afr. Agric. For. Res. Organ. 1958*, 1959 (42–7).

The work so far done makes it clear that no simple zonal correlation of the types found in various parts of this region is possible. The region must be divided into three sectors with widely divergent patterns of vegetation, and a preliminary study of these divergencies has brought to light a clear correlation with a simple climatic factor, the amount of rainfall per 1000 ft. of altitude.

1611. GACHET, C. Les forêts du Sambirano et de Nossi-Bé. I—III. **[The forests of the Sambirano and Nossi-Bé. I—III.]** *Bulletin de Madagascar, Tananarive* 8 (150–151), 1958 (945–63; 1042–64); 9 (152), 1959 (23–44). [F.] A.P.B.

(I) The Sambirano and its mouths. (II) The coastal and island forests of the N.W. (III) The forests of the mountains of the interior (catchment areas of the Sambirano).

1612. DANSEREAU, P. **Phytogeographia Laurentiana. II. The principal plant associations of the Saint Lawrence Valley.** *Contr. Inst. Bot. Univ. Montréal* No. 75, 1959. pp. 147 + 1 map, 1 dgm. 80 refs. [E.] [Cf. *F.A.* 21 No. 1521.]

1613. RICE, E. L., and PENFOUND, W. T. **The upland forests of Oklahoma.** *Ecology* 40 (4), 1959 (593–608). 36 refs.

A study based on 208 stands. The associations described are Oak/Loblolly-Pine forest, Oak/Hickory/Pine forest, Oak/Hickory forest, Oak/Hickory savanna, and Oak savanna. The only important tree species are *Quercus stellata* and *Q. marilandica*. All types were found to be reproducing themselves adequately.

1614. TROLL, C. Die tropischen Gebirge. Ihre dreidimensionale klimatische und pflanzengeographische Zonierung. **[Tropical mountain ranges. The three-dimensional zonation of their climate and vegetation.]** *Bonner Geographische Abhandlungen, Bonn* No. 25, 1959. pp. 93 + 28 photos, 1 map. 113 refs. [G.e.]

Compares the mountain vegetation of S. and Central America with that of Malaya, Africa etc. and discusses plant-geographic influences, e.g. the migration of boreal tree taxa into Mexico, and of sub-antarctic genera such as *Podocarpus* into America and S.E. Asia.

1615. ELDER, N. L. **Vegetation of the Kaweka Range.** *Tech. Pap. For. Res. Inst. N.Z. For. Serv.* No. 27, 1959. pp. 18 + 8 photos.

With special reference to the effects of sheep, burning, and grazing by deer.

1616. WEBB, L. J. **A physiognomic classification of Australian rain forests.** *J. Ecol.* 47 (3), 1959 (551–70 + 12 photos). 36 refs.

The rain-forest formations are classified into 12 possible subformations on the basis of exclusively physiognomic and structural features, which include leaf size; height and continuity of tree layers; proportion of evergreen, semi-evergreen, deciduous or araucarian emergents; and prominence of special life forms such as woody lianes and mossy epiphytes.

1617. TAYLOR, B. W. **The classification of lowland swamp communities in northeastern Papua.** *Ecology* 40 (4), 1959 (703–11). 9 refs.

The structure and floristic composition of 8 environmental sequences of climax swamps are described. The system of classification proposed by Beard for tropical America [cf. *F.A.* 16 No. 2813] is adopted, but with some modifications designed to facilitate the use of this system throughout the tropics.

2. SILVICULTURE

See also Nos. 1514, 1666–7, 2606–8.

1618. JAZĪRAĪ, M. H. **[Silviculture.]** *Principles of Silviculture, Forest Department, Teheran* No. 1, 1958. pp. 10 + 162. 15 refs. [Per.]

A short textbook for University students.

1619. **Tropical silviculture. Vols. I–III.** *FAO For. & For. Prod. Stud.* No. 13, 1957–1958. pp. vii + 190 + map; xv + 415; vii + 101. Many refs.

Vol. I sums up the status of tropical silviculture with particular reference to natural regeneration on the basis of discussion of the topic at the 4th World Forestry Conference at Dehra Dun in 1954, and a review of literature. Vols. II and III are reprints of the relevant papers read at the conference (already noticed in *F.A.*).

1620. FOGGIE, A. **Forestry problems of the closed forest zone of Ghana.** *J.W. Afr. Sci. Ass.* 3 (2), 1957 (131–47). 10 refs. A.P.B.

[Cf. *F.A.* 14 No. 1788.] Its ecology is presented with comments on demands for timber for export and local use. Possible silvicultural methods and their application in practice are also described.

1621. JØRGENSEN, E. L., and ANDERSEN, K. F. *Pinus contorta*, vækst og anvendelse i Danmark. **[*P. contorta*, its growth and use in Denmark.]** *Dansk Skovforen. Tidsskr.* 44 (9), 1959 (479–500). 11 refs. [Dan. e.]

Discusses: (1) provenances, citing British experience and its applicability to Denmark; (2) increment, presenting numerical data, in graphs and tables, derived from plantations in Jutland, and concluding that the figures agree quite well with unpublished data of the British Forestry Commission; (3) cultivation and tending, discussing (*a*) the use of *P. contorta* as the first crop on heaths and dunes, and especially its value as a nurse crop for Sitka Spruce on sites of potentially high quality but where frost, grass growth and poor drainage cause an early growth check; and (*b*) its silvicultural treatment in pure stands, either by medium spacing, fairly light low thinnings and final clear felling to produce small timber of good quality, or by wide spacing, heavy crown thinning with complete crown release, and early regeneration fellings; (4) economic aspects, concluding that *P. contorta* may well serve to increase forest plantings on marginal lands.

1622. HEIKURAINEN, L. Koivukysymys ojitetuilla soilla. **[Birch problem on drained peat lands.]** *Metsät. Aikak.* 1959 (9), (318–21). [Fi. e.]

Results of the third National Forest Survey in Finland show that the % of Birch is higher in drained areas than on any forest site type on firm ground. There are considerable differences between its occurrence in different climatic areas. On some peat types, conifers will predominate naturally, on others artificial regeneration will be necessary. On most drained peatlands, normal thinnings will solve the Birch problem. A study by the author shows that it is economically possible to produce forest consisting predominantly of conifers, to ensure good volume growth and stumpage prices, retaining a suitable proportion of Birch for biological reasons. The present predominance of Birch on drained peatlands arises from lack of proper silvicultural treatment. *From author's summary.*

1623. Stegmann, G. Anbau und Verwertung der Pappel in Westdeutschland. **[Cultivation and utilization of Poplars in W. Germany.]** *Holz-Zbl.* 85 (145), 1959 (1949). [G.]

Summarizes papers read at a meeting of the utilization section of the German Poplar Commission on: Recent experience with Poplars in the particle board and related industries (*Klauditz*); Targets and limits of Poplar growing in W. Germany (*G. A. Schütze*); High quality Poplar pulp by the calcium-bisulphite process (*T. Krause*); The semi-chemical pulping of Poplar and Willow grown outside the forest in Schleswig-Holstein [containing much reaction wood] (*K. F. Patt*); Poplar assortments (*Ulrich*); and Poplar yield studies (*Volkmann*).

1624. **[Poplars and Willows in Hungary.]** *Magyar Tudományos Akadémia Agrartudományok Osztályának Közleményei, Budapest* 15 (1/3), 1959 (213–336). [Hu.] C.G.B.

Comprises 14 papers, by different authors, presented to the section of agricultural science at the 1958 annual meeting of the Magyar Tudományos Akadémia. The papers are in Hungarian, without summaries, but translated contents lists in Russian and German are given. Subjects covered include: the present state and aims of Poplar growing in Hungary; Poplars and the pulp and paper industry; breeding Poplars and Willows; distribution of Poplar diseases; the role of Poplars in afforestation of sandy areas; growing Poplars from cuttings; growing Poplars along stream banks; native and hybrid Poplars and their pulping properties; technical properties of rods from some important Willow species; growing Poplars in the flood-plains; the role of the Water Service in Poplar growing; and spacing trials with hybrid Poplars.

22. Silvicultural Systems. Constitution and Composition of Stands; Forms of Stand

221. High Forest Systems

See also Nos. 1639, 1821, 2205, 2246.

1625. **[Detailed investigation of methods of felling and regeneration techniques in the high montane forest massif of the W. part of Szechwan province.]** *For. Sci., Peking* 1959 (5), (337–62). [Chin. russ.]

Presents the results of investigations by a Sino-Russian team on the distribution of vegetation and on the 25 basic and 10 derived forest types distinguished in the region. Taking into account the forest type, the conditions for regeneration, logging methods, and the importance of the forests, the correct methods of felling and regeneration are indicated for the various groups of forest types, e.g. in alpine mossy coniferous forests and alpine Bamboo/conifer forests on slopes < 35°, clear felling and replanting are recommended; in alpine Oak/conifer forests, selection felling; and in sparse alpine Rhododendron/conifer forests and alpine *Calamagrostis*/conifer forests no fellings at all, i.e. these are protection forests.

1626. Kugelberg, V. Skärmställning och överståndare. **[Shelterwood systems and reserve trees.]** *Skogen* 46 (22), 1959 (456–8). [Sw.]

[Cf. *F.A.* 20 No. 1637.] Describes the site, past treatment, regeneration and present condition (site class, age, stems/ha., height, ring width, diam., volume, stumpage value, increment etc.) of 2 shelterwood Pine stands, mean age 125 and 95 years respectively, and discusses their treatment and development during the 20 years after the first regeneration felling (1 and 11 years earlier respectively) by which time most or all of the reserve trees will have been removed and the young stands will be 15–20 years old. The article is illustrated with photographs of the 2 plots and breast-height increment cores of one tree from each.

1627. Penev, N., and Ignatov, S. Vlijanie na njakoi faktori vărhu povreždaneto na bukovija podrast pri izveždaneto na postepennata seč. **[The influence of certain factors on damage to Beech regeneration when carrying out shelterwood fellings.]** *Gorsko Stopanstvo* 14 (3), 1958 (3–10). [Bulg.]

Investigates the influence of regeneration height (≤ 50, 51–100, 101–200, > 200 cm.), the direction of felling, and the organization of extraction, on the numbers and proportions of advance growth damaged during felling and extraction. Damage increased with the height of the regeneration. It was least when felling was done uphill at an angle of 45° to the contour. Less damage was done by extraction along predetermined paths than by extraction at random.

1628. Vlasev, V., and Kolev, N. Okončatelna faza na kratkosročnata postepenna seč pri snežna pokrivka i malăk podrast. **[The final felling under a shelterwood system with [three] regeneration fellings at short intervals, done with snow cover and small advance growth.]** *Gorsko Stopanstvo* 14 (9), 1958 (6–10). [Bulg.]

The felling was done in a Spruce/Silver Fir/Pine stand with a snow cover of ca. 50 cm. (the regeneration of all three species being < 40 cm. high), and also in the spring for comparison. Under the winter conditions (snow), 74% of the Pine, 86% of the Spruce, and 71% of the Fir regeneration was undamaged by the felling and extraction, compared with 61, 74, and 61% respectively in the spring felling. The numbers of advance growth of each species were determined, and their height increment compared for 1956–58 in the felled areas, and under shelter (0·4–0·5 density). Some frost damage to the Spruce and Fir on the clearings was noted but, in general, winter felling is advised.

1629. SAUKEL, F. P. Plenterwaldbestände des Bayerischen Waldes. **[Selection forests in the Bayerische Wald.]** *Forstwiss. Cbl.* 78 (9/10), 1959 (279–97). 18 refs. [G.g.]

Seventeen farm woodlands managed by the selection system were examined, divided into (*a*) moderately, and (*b*) well stocked, and further subdivided according to site differences. Silver Fir formed ca. 70%, Spruce ca. 25%, and Beech the remainder of stand volume. Stands (*a*) on good sites had a standing volume of ca. 340 cu.m. and m.a.i. of 7·7 cu.m./ha.; on poorer sites 280 and 4·5 cu.m. Stands (*b*) on good sites had 580 and 8·3, and on poorer sites 500 and 6·0 cu.m. respectively. It is concluded that inadequate legislation has allowed widespread plundering of these selection forests, constituting an acute danger to the continued existence of this form of management. Optimum stockings (ensuring a stable selection structure and higher increment) are ca. 350–400 cu.m./ha. on better sites and ca. 300 on poorer ones. These will give a m.a.i. of 8–9 and 4–5 cu.m. respectively. Silvicultural recommendations are made for these stands.

222. Coppice, Pollarding and Lopping Systems

See also Nos. 1631, 2205.

1630. STUPNIKOV, V. G. V bajračnyh lesah stepnoj zony neobhodimy rubki glavnogo pol′zovanija. **[Principal fellings are necessary in the gully forests of the steppe zone.]** *Lesn. Hoz.* 11 (7), 1958 (20–2). [Russ.]

In these Oak/Ash forests traditionally regenerated by coppicing, fellings create a serious risk of erosion, particularly in the spring snow-melt. A method of clear felling in alternate contour strips (100 × 30–50 m.), leaving protective strips of forest along and across the sides of the gully, is described and details are given of coppice regeneration on the felling areas. For best coppicing, felling should be done between Oct. and May. The author's preliminary studies suggest that the residual strips of forest should be cut 2 years later.

226. Changes of Silvicultural System. Conversion (by System or Species)

1631. MARTINI, M. DE. La produzione dei boschi cedui in Campania e il loro miglioramento. **[The yield of coppice woodland in Campania and its improvement.]** *Ital. for. mont.* 14 (5), 1959 (169–87). [It.it.f.]

These coppice woodlands occupy > 209,000 ha., of which about one-fifth is pure Chestnut, the rest mixed. Yields by assortments for 1948–57 are given and discussed. The current tendency to go over to liquid fuel has produced a crisis in management, since the main use of the woods has been to provide fuel. The problems involved in conversion to high forest for timber production are discussed.

1632. KERESZTESI, B. Hozzászolas a homoki erdögazdálkodás kérdéséhez. **[Forestry on sandy soils [in Hungary].]** *Erdö* 8 (5), 1959 (177–82). [Hu.russ.g.]

Attempts to convert poor-quality *Robinia pseudoacacia* stands to Pine on dry, sandy soils gave unsatisfactory results. The need for further study of the costs and silvicultural difficulties involved in establishing Pine stands on such sites, is stressed.

1633. ANDREUCCETTI, E. La trasformazione della 'macchia mediterranea' nel moderno indirizzo dell' economia forestale. **[The conversion of the Mediterranean maquis in accordance with modern ideas of forestry.]** *Monti e Boschi* 10 (10), 1959 (522–8). [It.f.e.]

Describes an experiment in Sicily, for converting maquis by grubbing up the shrubs with a tractor-mounted bulldozer, followed by contour-strip cultivation and planting of Eucalypts (*E. rostrata*, *E. globulus*, *E. trabuti*, *E. botryoides*, and others) for pulpwood.

1634. SCHEER, R. L., and WOODS, F. W. **Intensity of preplanting site preparation required for Florida's sandhills.** *Occ. Pap. Sth. For. Exp. Sta.* No. 168, 1959. pp. 12. 6 refs.

[Cf. *F.A.* 20 No. 4368.] A slightly different account, with the same main conclusions, and stressing the soil-moisture aspect.

228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See also Nos. 1555–7, 1616, 2198–9, 2201.

1635. CHROUST, L. Vliv hustoty na vývoj a růst borové tyčkoviny. **[The influence of density on the development and growth of a pole stand of Pine.]** *Práce Vyzkum. Úst. Lesn. ČSR* No. 15, 1958 (93–117). 25 refs. [Cz.cz.russ.e.]

Tabulated and graphical data are presented on the influence of density (12,300, 5000, 2200 plants/ha.) on the diameter and height increment, stem form, and number, thickness, length and angle of branches, of Scots Pine up to 29 years.

1636. TIMOFEEV, V. P. Jarusnost′ lesnyh nasaždenij kak odno iz uslovij ih vysokoj produktivnosti. **[Storeyed structure in forest stands as one of the conditions for high productivity.]** *Lesn. Hoz.* 11 (8), 1958 (15–21). [Russ.]

Reports light, CO_2, air temperature and r.h. measurements made at different times of year in a European Larch plantation with an understorey of *Tilia platyphyllos*, *T. cordata* and *Acer platanoides*, and a shrub layer of *Sambucus racemosa*, at heights of 9 m. (upper part of the Larch crowns), 6·7 m. (middle of the Larch, *Tilia* and *Acer* crowns), 5·5 m. (below the Larch crowns, but in the *Tilia* and *Acer* crowns), and 0·2 m. (below the undergrowth). Findings are graphed, and the relative changes in values between different layers discussed in some detail. Sample shoots of the Larch were taken in August at heights of 8·5, 6 and 5 m., and their lengths and needle weights determined. Results show best growth at the highest level in the crown. Reference is also made to soil and root relations, mainly on the basis of Russian literature [no formal bibliography is provided]. The interrelations of these factors are discussed from the point of view that mixed, several-storeyed stands make the best use of the site and are less liable to injuries than other forms of stand.

23. Regeneration and Formation of Stands

See also No. 1625.

231. Natural Regeneration

See also Nos. 1619, 1766, 1782–4, 1811, 1927–8, 1958.

1637. Turček, F. J. Priebeh prirodzenej obnovy na Pol'aně. **[Natural regeneration in the Pol'ana Mts. [Slovakia].]** *Práce Vyzkum. Úst. Lesn. ČSR* No. 15, 1958 (213–25). 7 refs. [Slovak.russ.e.]

Discusses the natural regeneration of Beech, Silver Fir and Maple in a natural forest community, and of Spruce in pure stands and mixtures, from 1950 to 1953, with data on seedfall, seedlings/ha., seedling mortality, and pests of seeds and seedlings. By far the most serious pests are small rodents. [Cf. *F.A.* 20 No. 4376.]

1638. Kadlus, Z. Přirozené zmlazování modřínu na nelesních půdách v Orlických horách. **[Natural regeneration of Larch on old farmland in the Orlicky Mts.]** *Práce Vyzkum. Úst. Lesn. ČSR* No. 15, 1958 (169–91). 33 refs. [Cz.russ.g.]

The reproduction from six 60- to 90-year-old Larches was examined on an area of farmland abandoned in 1947–48 or earlier. Site data: mean annual temperature 5·3° C.; mean annual precipitation 900 mm.; 700–900 m. alt.; sandy loam soil; medium S. or S.W. slopes. The density of natural reproduction in relation to distance and direction from the seed-trees is mapped and tabulated; most was found on former ploughed fields, and almost none on former meadows. Recommendations are made for assisting natural regeneration of Larch on similar areas.

1639. Heinselman, M. L. **Natural regeneration of swamp Black Spruce [*Picea mariana*] in Minnesota under various cutting systems.** *Production Research Report, U.S. Department of Agriculture, Washington* No. 32, 1959. pp. 22. 27 refs.

Trials over 4 to 6 years of various forms of selective cutting, clear felling in strips or patches, and shelterwood felling are reported. Best results were obtained by clear felling in strips or patches combined with burning or removal of slash.

1640. Cayford, J. H. **Germination and survival of Jack Pine and Red Pine after scarification in southeastern Manitoba.** *Tech. Note For. Br. Can.* No. 78, 1959. pp. 14. 9 refs.

In 1954 an experiment was initiated in S.E. Manitoba to determine whether scarification of the forest floor after the removal of merchantable Jack Pine trees in a mixed Red Pine/Jack Pine stand would effectively induce Pine regeneration on the cut-over areas. Annual examinations were made between 1955 and 1958. Germination on scarified areas was much improved over unscarified areas, but seedling survival on both was poor and present distribution and abundance unsatisfactory. It is suggested that seedling survival may be increased by providing shade through leaving more crown cover and/or scattering the cone-bearing Jack Pine slash. *From author's summary.*

1641. Cooper, R. W., Schopmeyer, C. S., and McGregor, W. H. D. **Sand Pine [*Pinus clausa*] regeneration on the Ocala National Forest.** *Production Research Report, U.S. Department of Agriculture, Washington* No. 30, 1959. pp. 37. 11 refs.

In small-scale tests under controlled conditions, shade and protection from rodents, birds, and ants were essential for appreciable germination and survival. Only 1 seed germinated in full sunlight for every 9 under shade, and > 20 times as many seedlings became established under shade as in full sunlight. Under shade, and with protection from mice and ants, germination was almost equal on litter, burned litter, and bare sand. A series of large-scale tests was made to develop practical methods for regenerating cut-over areas where shade could not be provided. Preliminary studies had shown that seed sown just below the surface of the soil escaped the effects of high surface temperature. Clear felling in the summer and autumn, followed by mechanical scarification and partial lopping and scattering of cone-bearing branches from the tops of harvested trees, usually resulted in adequate reproduction. Use of tractors for skidding logs during felling operations also provided adequate ground scarification. Prescribed burning before clear felling gave adequate reproduction without further treatment, but in the conditions prevailing in Florida is seldom safe. Shading and fertilizing of nursery beds significantly increased the survival ratio of seedlings planted out in the field. Survival of 1 + 0 stock (71%) was significantly better than that of older stock (20%). Direct sowing was unsuccessful, chiefly owing to consumption of seeds by rodents, birds and ants. *From authors' summary.*

1642. Trousdell, K. B. **Site treatment reduces need for planting at Loblolly harvest time.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 102, 1959. pp. 11. 3 refs.

A study of 36 plots in 3-year-old plantations in Virginia planted after harvesting, which had had either no ground preparation (*a*), bulldozing (*b*) or disking (*c*). Treatments had little effect on survival and growth of planted seedlings, many of which had misshapen roots. Competition, the most important factor for the number of 'free-to-grow' seedlings, was greatest in (*a*) and least in (*b*) plots. These also had the greatest number of natural seedlings—on the average more natural than planted survivors. Planting was expensive and often unnecessary.

1643. Schultz, A. M., and Biswell, H. H. **Effect of prescribed burning and other seedbed treatments on Ponderosa Pine seedling emergence.** *J. For.* 57 (11), 1959 (816–7). 10 refs.

Compares emergence (not survival) in May 1957 on plots: (1) unburned for ⩾ 10 years; (2) burned in autumn 1953; (3) burned in autumn 1955; (4) burned in Oct. 1956, halfway through seedfall; (5) as (3) but cultivated with a Rotavator in Sept. 1956; (6) with brush removed by bulldozer in summer

1956; (7) with litter hand-raked to mineral soil, Aug. 1956; (8) of untreated Manzanita [*Arctostaphylos* sp.] thicket. Treatment (7) gave easily the highest emergence, followed by (5), (4), (3) and (6) in that order.

1644. TRELOAR, G. K. **Some factors affecting seedling survival of *Eucalyptus largiflorens* F. Muell.** *Aust. For.* 23 (1), 1959 (46–8). 2 refs.

A study was made of *E. largiflorens* seedlings that appeared in large numbers after the 1956 Murray River flood. Protection from rabbits and removal of overhead canopy were both found to have a significant effect on % survival during the first year.

1645. KADAMBI, K. **Observations on natural reproduction of Teak.** *Indian For.* 85 (11), 1959 (641–9 + 2 photos, 1 map). 15 refs.

A review of all the factors bearing on the problem in India.

1646. SOLODUHIN, E. D. O poroslevom vozobnovlenii nekotoryh drevesnyh porod Dal′nego Vostoka. **[The coppice regeneration of some woody species of the [Soviet] Far East.]** *Bot. Ž.* 44 (9), 1959 (1314–24). 6 refs. [Russ.]

In most forest types of the area, broadleaved species have a mainly auxiliary role, acting as nurses to natural regeneration of conifers, and protecting the soil while the conifers are small, especially on burns and clear-felled areas. The conifer regeneration is vigorous enough to form the main part of the stand, and it does not matter greatly which broadleaved species invade clearings and burns, or how they regenerate. Notes are given for many Far Eastern species (7 *Acer* spp., *Quercus mongolica*, 2 *Ulmus* spp., 3 *Betula* spp., *Phellodendron amurense*, *Juglans manshurica*, 2 *Fraxinus* spp. etc.) on the principal forest types in which they occur, their relative importance, the number and vigour of their coppice shoots etc. Coppice regeneration with > 2000 clumps of successfully overwintering shoots per ha. is considered excellent; < 500/ha. is bad.

1647. ROGERS, D. J., and ROGERS, P. H. **Sprouting capacity of Oak stumps in southern Wisconsin.** *For. Res. Note Wis. Coll. Agric.* No. 50, 1959. pp. 3. 2 refs.

A study was made in 3 recently clear-felled stands containing many *Quercus alba* and *Q. velutina*. The latter showed a much higher % of stumps sprouting (50–64% vs. 25–38% for *Q. alba*) and a slight superiority in height and number of shoots per stump. *Q. alba* coppices little after 100 years, whereas *Q. velutina* still coppices well.

232. Artificial Regeneration

See also No. 2611.

232.1. Choice and Trial of Species, Races etc.

See also No. 1536.

1648. Retningslinjer om valg av treslag og provenienser på Vestlandet. **[Recommendations on the choice of species and provenances in Vestland.]** Skogdirektøren, Oslo. 1959. pp. 38 + 2 maps. [Nor.]

Presents recommendations produced by the Vestland Forstlige Forsøksstasjon in 1954 and revised in 1958. The summer temperatures and the length of growing season found in Vestland are discussed and data are compared with those for Germany and Austria. Species recommended for use are Norway and Sitka Spruce, Scots Pine, Silver Fir and, to a lesser degree, Larch, Western Hemlock and other conifers; soil and climatic requirements and silvicultural treatments are discussed. Central Europe is divided into 9 provenance zones, by climate and altitude, and comparisons are drawn with Norwegian districts. Symbols (alphabetical and numerical) representing zones and altitudes are given for Norway itself, Europe, and N. America, and recommendations made in tabular form on suitable provenances for different districts. Guidance is also given on the economic altitude limit for Spruce in > 50 districts.

1649. TULSTRUP, N. P. Polsk rødgran, ædelgran og lærk: indtryk fra polske skov 1959. **[Polish Norway Spruce, Silver Fir and Larch: an impression of Polish forests in 1959.]** *Dansk Skovforen. Tidsskr.* 44 (11), 1959 (543–64). [Dan.]

Discusses briefly the general situation (forest area, species distribution, wages etc.), and describes some of the important stands of Spruce, Silver Fir and Polish Larch (*Larix decidua* var. *polonica*) with particular reference to the actual and potential use of Polish seed in Denmark and elsewhere in Scandinavia.

1650. ELORRIETA ARTAZA, J., LUXÁN VAQUERO, F. DE, and ALARCÓN MARTICORENA, F. Sección de repoblaciones e introducción de especies. Actividades diversas de la sección. **[Section for afforestation and introduction of species. Various activities.]** *An. Inst. For. Invest. Exp. Madrid* 30 (3), 1958 (23–32 + 6 plates). [Span.]

Reports on results of trials of Poplar hybrids and illustrates by means of graphs the comparative height growth during 1958 of various Poplar clones established in 1957. Trials of Eucalypts are also in progress.

1651. ESCALANTE, M. G. Un interesante árbol —el 'kiri' (*Paulownia tomentosa*). **[An interesting tree: *P. tomentosa*.]** *Bol. argent. for.* 18 (179), 1959 (5–6). 1 ref. [Span.]

Describes the tree and its wood, and discusses its possible use as a forest tree and/or ornamental in the '*chaco serrano*' area of Argentina.

1652. BROCKWAY, G. E. **Tree establishment on Esperance Plains.** *Repr.* from *Journal of Agriculture of Western Australia, Perth* (*Ser. 3*) 8 (3), 1959. pp. 8.

Briefly describes the soils, the climate and natural vegetation. As a result of past plantings by pioneers and at the Esperance Research Station, the following trees are recommended, chiefly for shelterbelts and shade: *Eucalyptus lehmanni*, *E. gomphocephala*, *E. globulus*, *Pinus pinaster* and *Acacia pycnantha*. Methods and cost of establishment, needs for fertilizer and rabbit protection, uses etc. are discussed.

232.11. Species Trials, including Forest Gardens, Trials of Exotics etc.

See also Nos. 1514, 1570, 1766, 1816–7, 2202, 2557, 2611.

1653. NEDKVITNE, K., and WENDELBO, P. Bartrærne i noen parken i og ved Bergen. **[Conifers in some parks in and near Bergen.]** *Tidsskr. Skogbr.* 67 (2), 1959 (89–99). 6 refs. [Nor.nor.]

Gives brief notes on the growth and success of over 50 species and varieties, mainly exotics, with some reference to their possible value as park or forest trees in W. Norway.

1654. DOYLE-DAVIDSON, A. R. **Western Hemlock, *Tsuga heterophylla*—its position in British forestry.** *Scot. For.* 13 (3/4), 1959 (114–21). 13 refs.

[Cf. *F.A.* 12 No. 1043.] Discusses the quality of wood grown in the U.K. on the basis of unpublished results of tests at Princes Risborough, concluding that it is a good general-purpose wood, with good pulping qualities too. Rate of growth, site requirements, silvicultural characteristics, pests and diseases (very susceptible to *Fomes annosus*) in the U.K. are discussed. It is thought unlikely that Western Hemlock will become a major species for planting in the U.K. until some way of controlling *F. annosus* is found.

1655. TURPIN, P., and PARDÉ, J. Caractéristiques et production de quelques peuplements résineux du Domaine des Barres. **[Characteristics and yield of some [exotic] conifer stands at the Domaine des Barres.]** *Rev. for. franç.* 11 (11), 1959 (785–96). [F.]

Presents and discusses data on increment and yield of *Tsuga heterophylla*, *Thuja plicata*, *Abies grandis*, *Cedrus atlantica*, *Pinus nigra* var. *calabrica*, *Pseudotsuga taxifolia*, and *Abies nordmanniana*.

1656. NÈGRE, M. Le bambou. **[Bamboos [in France].]** *Rev. for. franç.* 11 (10), 1959 (661–71). [F.]

An account of Bamboos grown in France (propagation, planting, tending, increment, harvesting, preservation and uses), notably at the Domaine de Prafrance (Gard) where, among others, *Arundinaria simonii*, *A. fastuosa*, *Phyllostachys aurea*, *P. nigra*, *P. pubescens*, *P. quiloi* and *Bambusa quadrangularis* are grown.

1657. KAUROV, I. A. Kačestvo pyl′cy i semjan introducirovannyh dal′nevostočnyh drevesnyh porod. **[Pollen and seed quality of some Far Eastern woody species introduced [into the Leningrad region].]** *Bot. Ž.* 44 (8), 1959 (1162–70). 15 refs. [Russ.]

Two methods [cf. *F.A.* 18 No. 106] were used to determine the viability of pollen from 66 Far Eastern tree and shrub species flowering in Leningrad [cf. *F.A.* 19 No. 3839], and the Soviet Standard methods were used to determine the laboratory and field germination, and germinative energy, of the seeds of 28 of them. Results are tabulated in full. Most of the species produced good-quality pollen and seed.

1658. ZAHARČENKO, S. A. Karkas v stepnom lesorazvedenii. **[*Celtis occidentalis* in steppe afforestation.]** *Lesn. Hoz.* 11 (12), 1958 (73). [Russ.]

Discusses the performance of *C. occidentalis* in the U.S.S.R. Trees of 25 years are 12–13 m. high, 20–25 cm. d.b.h., and withstand frosts of −32° C. The wood is only slightly inferior to that of *Buxus*, and the species is recommended for planting in steppe afforestation in the Krasnodar, Stavropol and Rostov regions.

1659. GOLIKOV, A. I. O preimuščestvah vozvyšennyh mestopoloženij pri introdukcii teploljubivyh drevesnyh rastenij. **[The advantages of elevated sites for the introduction of thermophilous woody plants.]** *Bot. Ž.* 44 (9), 1959 (1278–81). [Russ.russ.]

In *Eucommia ulmoides* plantations established in 1950 in Moldavia, considerable frost damage and no fruiting were noted on site (*a*) at 185 m.alt. in a valley sheltered from the wind, while little frost damage and some fruiting occurred on site (*b*) at 297 m. alt., open to the wind on all sides. Microclimatic investigations showed that water shortage in the soil towards the end of the growing season caused growth to stop earlier on (*b*), thus reducing frost damage, and in winter the max. temperatures were lower and min. temperatures higher than on (*a*). The importance is stressed of studying local as well as regional site conditions when contemplating the introduction of thermophilous species.

1660. BAJKOV, G. K. Opyty po akklimatizacii *Metasequoia glyptostroboides* Hu et Cheng v Botaničeskom sadu Baškirskogo filiala Akademii Nauk SSSR. **[Acclimatization trials with *M. glyptostroboides* in the Botanical Garden of the Bashkirian branch of the U.S.S.R. Academy of Sciences.]** *Bot. Ž.* 44 (7), 1959 (1004–7). [Russ.]

[Cf. *F.A.* 21 No. 352.] A short account of the raising of a few plants from seed sown in 1953. After the first year in a glasshouse, some were transplanted into the open, and their phenology and height growth are compared with those of the plants remaining in the glasshouse. The outdoor plants withstood winter weather that killed *Juglans regia* seedlings. Successful grafts were made of *M. glyptostroboides* scions on *Sequoia sempervirens* stocks, and vice versa.

1661. MOLOTKOV, P. I. Sekvojja gigantskaja v Zakarpat′e. **[*Sequoia gigantea* in Transcaucasia.]** *Lesn. Hoz.* 11 (12), 1958 (74). [Russ.]

Discusses the performance of *S. gigantea* in the Crimea and Transcaucasus since the first trials in 1858. Though it can survive in the mountains, conditions are best for it in the foothills of the area.

1662. NISHIMURA, S. **The characteristics of seedling trees raised from seed of *Sequoia sempervirens* obtained from California.** *Japanese Journal of Breeding, Tokyo* 7, 1958 (145–51). [Jap.] From *abstr.* in *Plant Breed. Abstr.* 29 (1), 1959 (133).

Fifteen seedling trees are described. They varied greatly in habit and growth rate. [Cf. *F.A.* 21 No. 1565.]

1663. PUDDEN, H. H. C. **Report on silvicultural research for the year 1958. High altitude trials.** *Extr.* from *Rep. For. Dep. Kenya 1958*, 1959 (14).

Twelve species, planted on Mt. Elgon in 1953 at 10,200 ft. altitude, annual rainfall 66 in., were assessed after 5 years. Unfenced plots had been browsed, but, in fenced plots, *Pinus patula* and *P. radiata* both had top heights of 16–17 ft. Of the other Pines, *P. pinaster* and *P. elliottii* were 6–8 ft., and *P. halepensis* and *P. canariensis* only 4 ft.; *Widdringtonia whytei* showed poor survival and was < 3 ft. *Thuja plicata* had almost all died; *Juniperus procera* showed relatively poor survival (just under 50% vs. > 70% for all Pines except *P. canariensis*) and had grown a little over 2 ft. Frost damage is thought to be the cause of the short branches that are a feature of *Cupressus benthami* and *C. lusitanica*, whose top heights were 7–9 ft.

1664. SCHORY, E. A., SR. **The Cajaput tree [*Melaleuca leucadendron*] in Florida**. *Carib. For.* 19 (3/4), 1958 [1959] (50–5). 2 refs.

This tree, first introduced into Florida in 1906, is well adapted to the low, wet, sandy soils where it is in many places crowding out the native *Taxodium distichum*. Properties and possible uses of the wood are discussed.

1665. GOLFARI, L. Necesidades climáticas del *Pinus radiata*, D. Don. (= *P. insignis*, Dougl.). **[Climatic requirements of *P. radiata*.]** *Rev. for. argent.* 3 (3), 1959 (77–84). 16 refs. [Span.span.]

Reviews briefly climatic conditions in regions where *Pinus radiata* has flourished as an exotic, and presents the results of studies in Argentina to correlate (1) form, general vigour, and growth rate, (2) longevity, and (3) resistance to pests and diseases, with climatic factors. Edaphic conditions were not taken into account in this study. Three distinct growth zones were found: (*a*) uniformly good, (*b*) variable and (*c*) poor. The optimum climate is temperate with not too marked a difference between summer and winter temperature (summer 15·5–21·5° and winter 8·5–12·5° C., with an absolute minimum of −7°). Rainfall should be heaviest in winter, but the lack of it in summer should be offset by clouds or the high relative humidity of an oceanic climate. In Argentina the regions approaching most closely to these conditions are a narrow strip of the Patagonian Andes and the S.E. coastal zone of Buenos Aires province. The further away from the the coast, the less favourable are the conditions.

1666. Repoblación forestal con pinos y eucaliptos en Misiones. **[Afforestation with Pines and Eucalypts in Misiones.]** Celulosa Argentina S.A., Puerto Piray. 1958. pp. 63. [Span.]

A report based on 20 years' experience by the Company in the Upper Paraná. The following species have been established long enough to prove their suitability for this region—*Araucaria angustifolia*, *Pinus elliottii*, *P. taeda*, *Eucalyptus saligna*, *E. grandis*, *E. alba*. Other species of *Pinus*, *Araucaria* and *Eucalyptus*, *Cunninghamia lanceolata*, and *Taxodium mucronatum* are still on trial. Trials with other *Pinus* spp. are projected. Information is presented on: (1) the species tried, their silvicultural characters, their introduction into this region and their uses; (2) climate and soils in Misiones; (3) choice of species according to soil type; and (4) methods used in raising, establishing and tending plantations of *A. angustifolia*, Eucalypts and Pines.

1667. JACOBS, M. R. Informe al gobierno de la Argentina sobre la ecología del eucalipto. **[Report to the Argentine government on the ecology of Eucalypts.]** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1019, 1959. pp. 120 + 86 + 1 tbl. [Span.]

A report, based on visits to 59 localities in 12 provinces of Argentina. Part I is a survey of natural conditions: topography, climate, soils, distribution of populations, land ownership and prices of wood. Part II deals with the potential value of Eucalypts for cultivation in Argentina, giving data on silvicultural characters, uses of the products, establishment of plantations, tending, management and natural regeneration, and listing species recommended for different regions. Appendices give (1) notes on plantations visited in different provinces, (2) climatic and edaphic comparisons between Argentina and Australia, and (3) information on Eucalypts collected as a basis for lectures given in Argentina.

1668. DIMJATI, A., and LOKITO. Pertjobaan berbagai djenis tanaman oleh daerah hutan. **[Trials of various species by forest districts [in Indonesia].]** *Rep. For. Res. Inst., Bogor* No. 74, 1959. pp. 30. [Jav.]

Presents a tabulated summary for 60 species, showing the forest district conducting trials, their purpose (e.g. for soil conservation and improvement, timber or resin production), scope, year started (1878 and on), area, and present condition, with comments.

232.12. Races and Provenance Trials

See also Nos. 1621, 1648–50, 2198.

1669. ROHMEDER, E. Beispiele für die Überlegenheit fremder Provenienzen über die einheimische Standortsrasse bei den Baumarten *Pinus silvestris* und *Picea abies*. **[Examples of the superiority of foreign provenances over local races of *P. sylvestris* and *Picea abies*.]** *Allg. Forstzeitschr.* 14 (43), 1959 (756–60). 8 refs. [G.g.]

Published and unpublished data from long-term trial plots at Les Barres (France), Schiffenberg (Hesse), Neulauterburg (S. Palatinate), and Wondreb (Upper Palatinate) for Pine, and S. Sweden [cf. *F.A.* 15 No. 2280], Bischofsreut [cf. *F.A.* 18 No. 3930] and Grafrath (Bavaria), for Spruce are discussed with reference to height, diameter, volume, stem form and branchiness. A tendency for provenances from E. Germany to outgrow local races in more oceanic climates appears to emerge for both species.

1670. POKORNÝ, J. Počátky lesní kultury na Černokostelecku a původ používaného osiva v období 1790–1920. **[The start of forest plantations at Černý Kostelec, and the provenance of the seed,**

1790–1920.] *Sbornik Vědeckých Prací Fakulty Lesnické, České Vysoké Učení Technické, Praha* No. 1, 1958 (21–44). 7 refs. [Cz.russ.g.]

Lists, where known, the provenance of seed in plantings made from 1790 to 1920, with *Picea abies, Abies alba, Pinus sylvestris, Larix decidua, Quercus* [*robur*], *Fagus sylvatica, Carpinus betulus, Betula alba, Alnus glutinosa, A. incana, Acer platanoides* etc.

232.13. Trials of Hybrids and Other Products of Tree Breeding

See also section 165 and No. 1650.

1671. COOK, D. B., and NYLAND, R. D. **Three young plantations of hybrid [European x Japanese] Larch.** *J. For.* 57 (10), 1959 (750–1, 754). 3 refs.

Three seed lots were sown in 1951: (*a*) British F_2 seed, (*b*) British, probably F_1 seed, and (*c*) seed from a Japanese Larch in Cooxrox forest, N.Y., surrounded by Japanese, hybrid and European Larches. The young trees were planted out in 1953–54, survival in Dec. 1957 being 91, 93 and 94% respectively. Mean heights then were 7·8, 7·7 and 7·6 ft., but the plots contained some superior individuals: six trees of 12 ft., two of 14 ft., and one tree from (*a*) 14·7 ft. high.

1672. DATHE, A. Die Anbauwürdigkeit der italienischen Pappelklone in Deutschland. **[The suitability of the Italian Poplar clones for planting in Germany.]** *Allg. Forstzeitschr.* 14 (41), 1959 (715–8). [G.g.]

Discusses chiefly experiments with the clones I. 214 (*a*), I. 455 (*b*), I. 262 (*c*) and Sacometti 78 b (*d*), near Plattling, Bavaria. Clone (*a*) proved highly resistant to *Dothichiza populea*, but suffered most from frost. Height and diameter growth of all the clones tried, though less than in Italy, exceeded those of *Populus* × *robusta* for an eight-year period. From a 15-year-old stand of (*d*) a mean d.b.h. of 39 cm. is reported.

232.2. Preparatory Work. Auxiliary Measures

See also Nos. 1633–4, 1642, 1809, 2245.

1673. MEDVEDEV, V. A., and PONOMAREVA, A. A. Mehanizacija lesokul'turnyh rabot na gornyh sklonah. **[The mechanization of forest plantation work on mountain slopes.]** *Lesn. Hoz.* 11 (11), 1958 (54–6). [Russ.]

Describes a tractor-mounted terracer, designed by VNIILM, which can terrace slopes of up to 40°, and also a terrace harrow, the RT–2.

1674. Novinki lesohozjajstvennoj tehniki. **[Novelties in forest technology.]** *Lesn. Hoz.* 11 (8), 1958 (65–6). [Russ.]

Describes briefly a light, tractor-mounted plough designed by P. A. Kuznecov, having a roller preceding the blade, so that the latter is lifted if the roller encounters a stump, rock etc. Also describes a new automatic fork caliper, developed by N. I. Popcov of VNIILM, which records, on a roll of paper, the diameter of each tree. By pressing a button, the operator can also record species, alongside the diameter measurement. Five such buttons are provided, with letters denoting 5 species.

1675. VAN [WANG], C.-L. Priživaemost' i prirost lesokultur pri plantažnoj i obyčnoj vspaške. **[Tree survival and growth on land ploughed by conventional and 'plantation' ploughs.]** *Lesn. Hoz.* 11 (8), 1958 (79). [Russ.]

Juglans regia and associated trees and shrubs were planted in spring 1956 on southern chernozem soils in the Crimea that had been ploughed to depths of (*a*) ca. 60 cm. and (*b*) 25–27 cm. in the previous July. Trees on (*a*) showed 10–15% better survival, and ca. 100% greater height and diameter increment than those on (*b*), and the moisture content in the 0–60 cm. horizon was 21·6% in (*a*) and 19·1% in (*b*).

232.3. Seed, Nursery Practice, Direct Sowing

232.31. Seed

1676. HACKE-OUDEMANS, J. J. Zaadeest en bos van La Joux in de Jura. **[Seed kiln and the forests of La Joux, Jura.]** *Ned. Bosb. Tijdschr.* 31 (11), 1959 (318–22). 1 ref. [Du.]

Discusses seed harvesting methods in the Silver Fir forests of the Jura, seed yields, the extraction, drying and cleaning of the seed, and the forests and their management since 1920.

232.311. Seed Production (Seed Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also No. 1563.

1677. RUDEN, T. Avl av skogsfrø. **[Production of forest seed.]** *Tidsskr. Skogbr.* 67 (1), 1959 (8–35). [Nor.]

Discusses breeding experiments in England at Alice Holt, in various parts of Finland, and in Norway. Subjects covered include propagating Poplars and conifers from cuttings, and seed collection (England), arboreta and provenance experiments, selection of trees for breeding, and seed orchards (Finland), trials of Poplar and Spruce provenances and production of seed of Larch, Pine, Ash, Birch and Spruce in orchards (Norway).

1678. DOLGOŠOV, V. Nekotorye osobennosti plodonošenija eli obyknovennoj. **[Some features of the fruiting of *Picea abies*.]** *Lesn. Hoz.* 11 (10), 1958 (77–8). [Russ.]

Collates the observations of several Russian workers on the frequency and quality of cone yields of Spruce over its natural range in the U.S.S.R.

1679. RUDOLF, P. O. **Seed production areas in the Lake States. Guidelines for their establishment and management.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 73, 1959. pp. 16. 16 refs.

Recommendations on best age-bracket for seed production, number of seed-trees per acre to produce a million plantable seedlings, and thinning, brush control etc. are given for *Pinus resinosa, P. strobus, P. banksiana, Picea glauca* and *P. mariana*. [Cf. *F.A.* 18 No. 1497.]

1680. SOE, K. **Anatomical studies of bark regeneration following scoring.** *J. Arnold Arbor.* 40 (3), 1959 (260–7). 16 refs.

In order to determine the duration of the effect of bark scoring on flowering and fruiting of both fast- and slow-growing trees, experiments were made on *Acer saccharinum*, *Populus deltoides* and a slow-growing Apple and Pear. Trunks and branches were scored by cutting through the bark to, and often into, the underlying xylem. Samples of the cut bark and underlying wood were taken every few days after scoring, in order to study the regeneration of the severed bark. New cambium was formed within a week after scoring, but complete restoration and functioning of the phloem required about 3 weeks. If done at an appropriate time of year, a simple scoring may check phloem transport long enough to induce flowering and fruiting, at other times the process can be repeated every 2–3 weeks.

232.312. Seed Collection, Extraction and Grading (including Seed Weight)

See also No. 1842.

1681. IVAŠČENKO, M. P. Vyhod i kačestvo semjan listvennicy sibirskoj v zavisimosti ot srokov sbora. **[Yield and quality of Siberian Larch seed in relation to the time of collection.]** *Lesn. Hoz.* 11 (10), 1958 (29–31). [Russ.]

Investigation of germinative energy of seeds collected between 8 Aug. and 25 Sept. in the southern montane region of Siberia indicated that the last date was the best. The yield of clean seed based on weight of freshly gathered cones varied from 3·1% on the first, to 10% on the last date.

1682. KUŠNIKOV, N., and KAŠIN, V. Vozmožnosti udlinenija srokov sbora semjan listvennicy Sukačeva. **[The possibilities of prolonging the period for collecting seed of *Larix sukaczewii*.]** *Lesn. Hoz.* 11 (9), 1958 (60–1). [Russ.]

Experiments from 1949 to 1956 with collections made between Nov. and April indicated that seed collected in Nov. had the best germinative capacity (31%). This month and Dec. are favourable as regards weather, and it is questionable whether later collections are worth while.

1683. MCLEMORE, B. F. **Cone maturity affects germination of Longleaf Pine seed.** *J. For.* 57 (9), 1959 (648–50). 5 refs.

Samples of cones were taken at 4 different dates from 27 specimens of 40-year Longleaf Pine, and divided into sp.gr. classes. Differences in mean germination % by cone sp.gr. classes were highly significant, mainly because of the much higher germination from low sp.gr. cones for the first three dates of collection. Owing to the quite wide variations in the date of cone maturity between individual trees, however, the only safe way to lengthen the collecting season is to confine early efforts to trees on which the cones have a sp.gr. ⩽ 0·88.

1684. MARTÍN BOLAÑOS, M. Ensayo y crítica de un sequero móvil de calefacción interior. **[Tests and criticism of a portable seed drier and extractor with interior heating.]** *Montes, Madrid* 15 (88), 1959 (353–7). [Span.]

The apparatus consists of a rectangular metal chest 2·11 × 1·35 × 1·88 m. with two sieves in the form of hexagonal drums placed longitudinally and side by side in the upper half; these can be turned by means of an exterior handle and can be opened to receive the cones (which are fed to them through hoppers) and to be emptied of the extracted cones. Two trays immediately below the sieves receive the seed and, finally, the empty cones. In the space between the two trays, and occupying nearly the whole width of the container, is a tunnel containing a furnace that has its own external chimney. The whole apparatus can be taken apart and is portable. The results of tests are given and the merits of the extractor discussed.

232.314. Seed Purchase, Trade and Transport (including Seed Certification and Legislation for this Purpose)

1685. KARSANA, M. E. Distribusi dan harga bidji[2] kehutanan. **[The distribution and price of tree seeds.]** *Rep. For. Res. Inst., Bogor* No. 75, 1959. pp. 7. [Jav.]

Discusses briefly methods of dispatch inside and outside Indonesia, and seed collection, and gives tables showing seed prices and exchanges of seed with 23 institutions in various other countries (e.g. Taiwan, Fiji, Sudan, Argentina, Australia, S. Africa, India, U.S.A.) during 1958.

232.315. Seed Storage and Treatment

See also Nos. 1431, 1697, 1710, 2038.

1686. SHIH, C.-L. **[The effect of ultrasonic waves on the growth of seeds of some woody species.]** *For. Sci., Peking* 1959 (5), (381–6). 5 refs. [Chin. chin.russ.]

After ultrasonic treatment (25 kilocycles/sec.) for 20 min., germination of seeds of *Cunninghamia sinensis*, *Pinus massoniana* and *Pseudosassafras tzumu* improved by 16, 25 and 19% respectively over controls. Soaking in a gibberellin solution followed by 30 min. of ultrasonic treatment did not give conclusive results with seeds of *C. sinensis* and *P. massoniana*, but germination of *P. tzumu* was 19% better than with ultrasonic treatment alone, and 43% better than controls. Ultrasonic treatment (25 kc./sec.) of seeds of *Schima confertiflora* (15, 20 or 30 min.) and *Betula luminifera* (15 or 20 min.) did not improve their germination.

1687. SIMAK, M., and GUSTAFSSON, Å. Röntgenanalys och det norrländska tallfröets kvalitetsförbättring. **[X-ray analysis and improvement of the quality of N. Swedish Pine seed.]** *Svenska Skogsv-Fören. Tidskr.* 57 (3), 1959 (475–85). 13 refs. [Sw.e.]

When, in a small-scale experiment, early-harvested cones were stored between layers of foam rubber at 24° C., the % of fully developed embryos (seed class IV) increased, but less so than the proportion of empty (O) and embryo-less (I) seeds, so that there was a decrease in the calculated germinability in % of all seeds, but an increase in the % of seeds with embryos (II–IV). Storage at 4° C. had little effect. In a test on a larger scale, in which some 10,000 immature seeds of 3 different batches were treated by an 'equilibration' [cf. *F.A.* 19 No. 327] method in which they were slowly rotated for about 3 months under moist conditions at 4° C., the %s of classes O, I and IV again increased, though slightly. At the same time the total germination % in sand increased considerably, and also germination rate, dry weight of seedlings etc. The method is considered promising for practical use.

1688. FOWLER, D. P. **Rapid germination of White Pine [*Pinus strobus*] seed.** *For. Chron.* 35 (3), 1959 (203–11). 7 refs.

Removal of the seed-coat from fresh seed gave more rapid germination and a higher germination % than stratification for 20 days at 40° F. Three types of soaking, (*a*) aerated water, (*b*) water changed twice daily, and (*c*) unchanged water, and three durations (3-, 7-, and 10-day soaks) were tested on seed both with and without seed-coats. Soaking in (*a*) at all durations gave results almost as good as 20 days' stratification; (*a*) was superior to (*b*) which was, in turn, superior to (*c*). In the case of (*b*) and (*c*), germination decreased as soaking time increased. Attempts to germinate seed directly from cones that had not been allowed to dry were unsuccessful. *From author's abstract.*

1689. KOZLOWSKI, T. T., and GENTILE, A. C. **Influence of the seed coat on germination, water absorption, and oxygen uptake of Eastern White Pine seed.** *For. Sci.* 5 (4), 1959 (389–95). 13 refs. (Also, a briefer account, as *For. Res. Note Wis. Coll. Agric.* No. 48, 1959.)

Intact (*a*) and punctured (*b*) seeds of *Pinus strobus* were sown in vermiculite in greenhouse flats, and germination was observed over a 52-day period. Punctured seeds had the seed-coat broken with a razor blade before planting, care being taken not to injure the seed contents. Germination began earlier and was more regular in (*b*) than in (*a*); 50% of eventual total germination of (*b*) occurred within a 5-day period beginning 9 days after planting, and total germination was higher. Uptake of water and O showed similar patterns, being rapid for 2 days after sowing, continuing thereafter at a reduced rate, and finally increasing rapidly again when germination began. Removal of the seed-coat markedly accelerated the rate of O uptake. The seed-coat, as a barrier to O diffusion, appears to be an important factor in preventing early germination in unstratified seed.

1690. MOLINA RODRIGUEZ, F., and ZULUEITA ARTALOITIA, J. Centro Regional de Enseñanzas, Investigaciones y Experiencias Forestales de Lourizán (Pontevedra). Sección de investigaciones y experiencias. Semillas. **[Regional Centre for Forest Training and Research, Lourizán (Pontevedra). Research section. Seed.]** *An. Inst. For. Invest. Exp. Madrid* 30 (3), 1958 (220–2). [Span.]

Experiments in seed pre-treatment gave the following results: (1) *Robinia pseudoacacia*—best results were obtained by immersing the seed in water at 90° C. and then allowing it to soak for 24 hr.; (2) *Cercis siliquastrum*—27·6% germination at the end of 50 days was obtained by treatment with a 58° Baumé concentration of H_2SO_4 for 1 hr.; (3) *Acacia aneura*—variable results with both types of treatment; the best germination from hot-water soaking was 74·5% after 11 days by treating with water at 100° C., and from H_2SO_4, 26·5% after 14 days by treating with H_2SO_4 for 1 hr.

1691. GARCÍA SALMERÓN, J., and BAÑO BREIS, F. DEL. Acción del bromuro de cetiltrimetil amonio sobre meristemos de *Pinus halepensis* Mill. **[Action of cetyl-trimethyl ammonium bromide upon meristems of *P. halepensis*.]** *Montes, Madrid* 15 (89), 1959 (471–81). 8 refs. [Span.]

In further investigations into substances suitable for keeping seed free from fungus attack during germination [cf. *F.A.* 20 No. 3071], meristematic cells of *P. halepensis* were isolated and treated with cetyl-trimethyl ammonium bromide (c.t.a.b.) and compared biometrically with untreated cells. The mechanism of the penetration into cells of ionizable substances, such as the one used, is discussed: they do not obey the simple rules of diffusion, and the ions can be absorbed individually without taking account of the internal protoplasmic concentration or the external concentration of the solution. Comparisons of the biometric constants of treated and untreated cells show that c.t.a.b. in aqueous solution acts on the meristematic cells of young *P. halepensis* from treated seed, resulting in an enlargement of the nucleus.

1692. JANČAŘÍK, V., and UROŠEVIĆ, B. Vliv moření na mykofloru a klíčivost smrkového semene. **[The effect of fungicides on the mycoflora and on the germination of Spruce seed.]** *Práce Výzkum. Úst. Lesn. ČSR* No. 15, 1958 (7–47). 41 refs. [Cz.cz. russ.f.]

Laboratory investigations were made of the effect of seven dry, semi-dry, or wet dressings, and of washing in water, on the mycoflora and on seed germination and germinative energy of Spruce seed from 5 areas in Czechoslovakia. The fungicides tested were Agronal (phenylmercuric bromide), Novozir (Zn dimethyldithiocarbamine), TMTD (tetramethylthiuramdisulphide), Cu oxyquinolate, $KMnO_4$, formalin, and Phytostrept (an antibiotic). Results are tabulated. Short descriptions and photomicrographs of the 37 species of fungi noted on the seed are given. Agronal was the most effective of the substances tested.

1693. UROŠEVIĆ, B. Některé zkušenosti s mořením žaludů v laboratorních a poloprovozních podmínkách. **[Some results of laboratory and large-scale trials of treating acorns with fungicides.]** *Práce Výzkum. Úst. Lesn. ČSR* No. 16, 1959 (163–98). 33 refs. [Cz.cz.russ.e.]

Reports continued experiments [cf. preceding abstract] with the same fungicides, the efficacy of which against many different fungi was determined. *Penicillium* spp., *Trichothecium lignorum* and some other saprophytic fungi were resistant to all the fungicides, in varying degree. The treated acorns should be stored in wet sand, in the same way as untreated ones.

232.318. Seed Testing. Germination Tests. Seed Quality

See also Nos. 1657, 1681–3, 1687.

1694. Maksiḱ, S., and Galeva, M. Kvalitetnite svojstva na šumskite seminja so provenencii od teritorijata na NR Makedonija. **[The quality of forest seeds from the People's Republic of Macedonia.]** *Godišn. Šum. Inst., Skopje* 2 (1), 1957 (87–120). 8 refs. [Maced.f.*f*.]

Tabulates extensive data on seed tests covering 10 years and 74 species. The data include seed origin; weight; cleanness; viability as assessed by cutting, indigo-carmine staining, and laboratory germination; field and laboratory germination; sowing density; plant %; etc.

1695. Evangulov, N. G. Kačestvo semjan sosny v Zapoljar′e. **[The quality of Pine seed N. of the Arctic Circle.]** *Lesn. Hoz.* 11 (12), 1958 (71–2). [Russ.]

Discusses personal observations and Scandinavian and Russian literature on *Pinus sylvestris* var. *lapponica* seed, with particular reference to seed quality in the Murmansk area (ca. 69° N.).

232.32. Plant Rearing. Nursery Practice

See also Nos. 1844, 2611.

1696. Función económica de los viveros forestales. **[The economic function of forest nurseries.]** *Agric. venez.* 23 (208), 1959 (52–7). [Span.]

Short notes on the work and functions of the Venezuelan Ministry of Agriculture's forest nurseries, of which there are 18 in all, distributed among the Ministry's 8 administrative zones.

1697. Stahejko, F. G. Vyraščivanie listvennicy sibirskoj na pitomnikah. **[Raising Siberian Larch in nurseries.]** *Lesn. Hoz.* 11 (12), 1958 (33–6). [Russ.]

When sown in the steppe zone, seed soaked for 2 days (*a*) and untreated seed (*b*) gave greater yields of seedlings than seed that had been kept 25–30 days in snow (*c*). In the forest-steppe zone (*c*) was best, then (*a*) and then (*b*). In the northern steppe zone, seedlings could be grown with very little watering, provided that they were given artificial shade. In the forest-steppe zone neither watering nor shading was necessary for seedlings on ground with a water-table not deeper than 1–3 m. from the soil surface.

1698. Chiang, W.-J., Chao, T.-P., and Sun, Y.-C. **[Getting high yields of *Thuja orientalis* seedlings.]** *For. Sci., Peking* 1959 (5), (363–9). [Chin.russ.]

An account of nursery work in which careful soil cultivation, fertilizing, irrigation, greater sowing density, weeding and pest control gave a yield of 721,928 seedlings/mu [1 mu = 0·152 acre]. Seedling heights [at 1 year?] were 25–45 cm., and root-collar diameters 0·3–0·5 cm.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also Nos. 1539, 1544–5, 1715, 2437, 2533.

1699. Stevčevski, J. Pedološki ispituvanja na počvite od šumskite rasadnici vo s. Ercelija i gr. Prilep. **[Examination of the soil of nurseries in Erdželija and Prilep [Macedonia].]** *Godišn. Šum. Inst., Skopje* 2 (1), 1957 (121–51). 23 refs. [Maced. e.*e*.]

Covers pedogenetic factors, mechanical structure, chemistry, and the maintenance of fertility and soil improvement at both nurseries.

1700. Wilde, S. A., and Krause, H. H. **Soil analysis in service of nursery practice.** *Tree Plant. Notes* No. 37, 1959 (1–5). 10 refs.

Appraises the relative significance of the results obtained by analysis of various properties of nursery soils, and stresses the limitations of certain analytical data. The value of systematic soil analyses is illustrated by a concrete example, presenting a record of changes in the fertility status of a nursery soil during a 7-year period of stock production.

1701. Mony, C. C. **Manual application of methyl bromide—soil fumigant.** *Tree Plant. Notes* No. 37, 1959 (7–8).

Detailed instructions for fumigating nursery beds with MeBr under polyethylene covers.

1702. Clifford, E. D. **A rapid method of fumigating nursery soils with methyl bromide.** *Tree Plant. Notes* No. 37, 1959 (9–10).

Describes the operation of a machine (illustrated) that simultaneously lays down polyethylene covering and injects MeBr gas into the soil. It can treat a 4 × 525-ft. seedbed in one-half of a man-hour compared with ca. 10 man-hours using hand methods. A machine called a 'Poly-triever' has also been developed to pick up and re-roll the covers.

1703. Ignatieff, V., and Page, H. J. **Efficient use of fertilizers. (Revised and enlarged edition.)** *FAO agric. Stud.* No. 43, 1958. pp. 355. 37 pp. of refs.

[Cf. *F.A.* 14 No. 1172.] Two new chapters have been added, one dealing with crops and their soil and nutrient needs, and the other with the economic aspects of fertilizers.

1704. Giordano, E. La clorosi degli eucalitti in vivaio. I. Osservazioni sul trattamento con chelati. **[Chlorosis of Eucalypts in the nursery. I. Notes on its control by chelates.]** *Pubbl. Cent. Sper. Agric. For., Roma* 2, 1959 (175–81 + 3 plates). 10 refs. [It.it.e.*e*.]

About one month after transplanting into pots, seedlings of *Eucalyptus resinifera* were affected by chlorosis, causing progressive dieback of the shoots, the formation of spotted necrosis between the leaf venation, and a slowing down of growth. The factors mainly responsible were a high soil reaction and excessive moisture. Attempts were made to improve the physical condition of the soil by reducing irrigation and giving the plants the iron they needed. An initial treatment with $FeSO_4$ was not very successful, and chelating agents were therefore tried. A 1% water solution of Sequestrene NaFe applied to the leaves had no effect, but when it was applied to the soil (ca. 200 c.c./plant) chlorosis completely disappeared after 15 days. The treated seedlings also showed more vigorous growth after ca. 2 months. [Cf. *F.A.* 18 Nos. 1742–3.]

1705. Rambelli, A. La clorosi degli eucalitti in vivaio. II. Indagini microbiologiche. **[Chlorosis of Eucalypts in the nursery. II. Microbiological research.]** *Pubbl. Cent. Sper. Agric. For., Roma* 2, 1959 (183–9 + 1 plate). [It.it.e.*e.*]

The author has determined the total microflora under chlorotic Eucalypt seedlings (*a*) growing in pots, comparing it with that of the soil under healthy plants (*b*), and of chelate-treated soil (*c*). The number of micro-organisms (mostly bacteria) after 3 days' incubation were, per g. of soil, (*a*) 1284, (*b*) 1908, and (*c*) 3379.

1706. Vsevolozhskaya [Vsevoložskaja], G. K. **The effect of micro-fertilizers on the quality of seedlings of certain species of trees.** *Trudy Brjanskogo Lesohozjajstvennogo Instituta, Brjansk* 8, 1957 (115–25). [Russ.] From *abstr.* in *Chem. Abstr.* 52 (21), 1958 (18667). P.R.

The effect on seedlings of *Fraxinus excelsior*, *Quercus robur*, *Ulmus laevis*, *Pinus sylvestris* and *Acer platanoides* of Zn, Cu, B, Mo, Mn and Mg was studied. Best effects were obtained from the addition of the salts of B, Zn, Cu, Mg and Mn, which increased the development of the root systems of the seedlings and their general growth.

1707. Cooper, R. **Bacterial fertilizers in the Soviet Union.** *Soils & Fertil.* 22 (5), 1959 (327–33). 18 refs.

Report of information mainly gathered from conversations during visits to a number of laboratories and field stations in Moscow, Leningrad, Kiev, Tashkent and Alma-Ata in 1958.

1708. Markovskaja, M. P., and Mišanina, A. T. Ispol′zovanie bakterial′nyh udobrenij dlja ulučšenija rosta sejancev. **[The use of bacterial fertilizers to improve seedling growth.]** *Lesn. Hoz.* 11 (8), 1958 (37–8). [Russ.]

Details results of experiments on seedlings of *Fraxinus pennsylvanica* with 'nitrobacterin', 'phosphorobacterin', and 'silicate bacteria', applied separately and together. All the variants improved growth, the combination giving the best results. Seedlings of Birch, Apple and *Amelanchier* sp. responded similarly.

232.323. Sowing and Covering

1709. Chroust, M. Příspěvek ke způsobu konstrukce norem výsevu semen v lesních školkách. **[Standardization of sowing rates in nurseries.]** *Sbornik Vědeckých Prací Fakulty Lesnické, České Vysoké Učení Technické, Praha* No. 1, 1958 (77–86). 9 refs. [Cz.russ.g.]

[Cf. *F.A.* 18 No. 2761.] Discusses the factors affecting sowing rate, on the basis of 3 years' investigations on Scots Pine and Larch. No standard rate for all Czechoslovakia can be established.

1710. Hofman, J., and Heger, B. Výsledky provozních výsevů douglasky v roce 1956. **[Results of large-scale sowing of Douglas Fir [in Czechoslovakia] in 1956.]** *Práce Výzkum. Úst. Lesn. ČSR* No. 16, 1959 (85–100). 10 refs. [Cz.russ.e.]

Ca. 1500 kg. of seed was spring-sown, and data on seedling height, root length, root-collar diameter, and yield of seedlings per kg. of seed, were collected from 287 nurseries. Neither provenance (4 from Washington, 2 British Columbia, 1 Bornholm, Denmark) nor pretreatment (soaking in water, stratification etc.) had any significant influence on seedling growth. The date of sowing was the most important factor: in sowings from 1 April to 20 June, the best time was ca. 15 April in areas at 200–400 m. alt. and ca. 5 May at 400–800 m. alt. Sowing in June gave very poor results. Total seedling production was low (ca. 11,000/kg. seed). In future, the usual autumn sowing will be preferred, and spring sowing done only in exceptional circumstances.

232.324. Transplanting and Lining Out, including Grading of Seedlings

See also Nos. 1742, 1752.

1711. Stoddart, W. F. **One-man lining out board.** *Quart. J. For.* 53 (4), 1959 (338–9).

Describes and illustrates the board, the method of working with it, and its advantages (mainly cheapness and simplicity).

1712. Leak, W. B. **Development of Yellow Birch nursery stock not affected by transplanting.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 91, 1959. pp. 4.

In a study at Burlington, Vermont, of methods to reduce root competition in *Betula lutea*, there was no significant difference in survival and growth between transplanting and thinning. Larger transplants (2·5 in.) appeared to do better than smaller ones (1·5 in.) and root pruning before transplanting tended to reduce growth. Nearly all plants had multiple stems, apparently following dieback of the terminal shortly after transplanting or thinning.

232.325. Tending (in both Seedbeds and Transplant Beds)

See also No. 1959.

1713. Dakev, T., and Naumov, Z. Opit za najpodhodjašto mulčirane v Svogenskija gorski razsadnik 'Cerovski Livadi'. **[Investigation to find the most suitable mulch in 'Cerovski Livadi' forest nursery.]** *Gorsko Stopanstvo* 14 (7), 1958 (16–21). [Bulg.bulg.]

Chopped straw mulches 2, 4, 6, 8 and 10 cm. deep were used in the nursery, and records kept of the soil moisture under them to depths of 40 cm., during the summer. With *Pinus nigra* var. *austriaca*, the best mulch depth was 2 or 4 cm. Height growth and root-collar diameter were greatest with these mulches, and decreased with increasing mulch depth, but even the 10-cm. mulch gave better results than unmulched controls. In a wet year, 2-cm. mulches are recommended; in a normal or droughty year, 4-cm. ones.

1714. Rummukainen, U. Simatsiinin käytöstä rikkaruohojen torjuntaan kesän 1959 kokeiden valossa. **[The use of simazin in controlling weeds in forest nurseries.]** *Metsät. Aikak.* 1959 (8), (273–5, 282). 2 refs. [Fi.e.]

[Cf. *F.A.* 19 Nos. 4371–2; 20 No. 1743.] Rates of application of as little as 1 kg. simazin (2-chloro-4, 6-ethylamino-S-triazine) per ha. reduced weed coverage to about 14% of that on untreated plots. *Poa annua*, *Sagina procumbens*, *Gnaphalium uliginosum* and *Capsella bursa-pastoris* were susceptible, and *Sonchus arvensis* and *Agropyron repens* resistant. The chemical was more effective in the wet spring of 1958 than in the dry one of 1959. In the areas sprayed in 1958 with 1–2 kg./ha., many susceptible species grew well the following summer. Seedlings of *Pinus sylvestris* were very susceptible to damage by 2–3 kg./ha. in the first 30–35 days after sowing, but became rapidly more resistant thereafter. Seedlings of *Picea abies* and older plants of both species were more resistant.

232.326. Salvage of Overgrown Seedlings and Transplants. Root or Shoot Pruning etc.

See No. 1807.

232.327. Protection Measures in Nurseries

See also Nos. 1641, 1697, 1985–8, 2014, 2017, 2048, 2083.

1715. HANSBROUGH, T., and HOLLIS, J. P. **The effect of soil fumigation on the growth and yield of Loblolly Pine seedlings in the nursery.** *Tree Plant. Notes* No. 37, 1959 (13–6).

On old-field soils at Homer, La., heavily infested with nematodes, Loblolly seedlings were raised at two densities (30 and 60 per sq. ft.), and certain plots treated with various nematocides, with the following results: Nematode populations were greatly reduced during the period of active seedling growth. The yield of plantable seedlings was almost doubled by fumigation combined with an increase in density from 30 to 60 per sq. ft. Seedlings had better morphological characteristics within each grade, regardless of, and unaffected by, density.

232.328. Vegetative Propagation

See also No. 1660.

1716. IS[H]IKAWA, H., and KUSAKA, M. **[The vegetative propagation of cuttings of *Pinus* species. 1. Vegetative propagation of Japanese Black Pine [*Pinus thunbergii*] using leaf-bundles.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 116, 1959 (59–64 + plate). 27 refs. [Jap.e.*e.*]

[Cf. *F.A.* 17 No. 3887.] A difficulty in propagating from leaf-bundles is that such material, even when it roots, does not readily develop its dormant buds. The authors successfully overcame this difficulty by removing the new-growth leaders from a 12-year-old tree in April 1957, as a result of which dormant buds in leaf-bundles on 1956 short shoots developed. These 'pre-developed' leaf-bundles were used for propagation in the following year. When given IBA treatment they rooted well and developed strong shoots.

1717. ENRIGHT, L. J. ***Cephalotaxus* [*drupacea*] cuttings respond to rooting aids.** *Amer. Nurserym.* 110 (7), 1959 (16).

Cuttings were treated with: (1) Rainbow Rooting Powder Woody; (2) Rainbow Rooting Powder Semi-woody, both containing 2, 4, 5-T and Na salt of naphthalene acetic acid, but with a lower concentration in (2); (3) Hormo-root C (8% IBA and 15% Thiram). (1) gave 100% rooted cuttings and the longest and greatest number of roots, (3) gave very poor rooting and (2) was intermediate.

1718. CHANDLER, C. **The propagation of *Larix* from softwood cuttings.** *Contr. Boyce Thompson Inst.* 20 (3), 1959 (231–8). 6 refs.

Cuttings used were from trees of *Larix decidua*, *L. leptolepis*, *L. laricina*, *L. gmelinii*, *L.* × *eurolepis* and from unnamed hybrid seedlings produced at the Boyce Thompson Institute. From 1948 to 1956 various experiments were made to find a suitable method for rooting softwood cuttings of Larch. Only occasional rooting took place in a conventional greenhouse bench or in a Wardian case. Sugar and fungicide treatments proved ineffective. Success came in 1956, 1957 and 1958 from the use of a Watco mist-control unit installed in the greenhouse, with sand as the rooting medium. Two- to 4-year-old trees furnished the best cutting material, and least rooting was obtained from cuttings from 27- to 30-year-old stock. Treatment with Hormodin 3 promoted rooting of cuttings from all trees > 4 years of age. Cuttings taken in August and September proved superior to those taken in May or June. Tip cuttings from terminal shoots rooted more easily than the basal portions. These findings now make it possible to secure enough cutting material for clonal field tests. *From author's summary.*

1719. FLOOR, J. **Report on experiments with mist propagation of cuttings.** *Transl. Nat. Inst. Agric. Engng., Silsoe* No. 54, [1958?]. pp. 19 + 3 tbls., 2 dgms., 6 photos. 30 refs. Transl. from *Mededeling, Instituut voor de Veredeling van Tuinbouwgewassen, Wageningen* No. 118, 1957.

The method, equipment (including apparatus for controlling the spray) etc. are described and results of experiments on fruit trees, shade trees and ornamental trees and shrubs are given. Cuttings (all treated with 2% IBA) of the following shade trees rooted well: *Acer* spp., especially *A. saccharinum*, *Betula nigra*, *Tilia cordata* and *T. europaea* and *Ulmus carpinifolia* 'Bea Schwarz'. *T. tomentosa* gave results rather below the average, and *B. verrucosa* vars. *dalecarlica* and *fastigiata* gave scarcely any rooted cuttings.

1720. BOGDANOV, B. Vkorenjavane na reznici ot răbest časkodrjan. **[The rooting of *Euonymus europaeus* cuttings.]** *Gorsko Stopanstvo* 14 (10), 1958 (10–20). [Bulg.bulg.]

An account of investigations, covering the best time to take the cuttings, the influence of the age of the stock-plant on rooting, etc.

1721. VAŠKULAT, P. N. Značenie temperaturnyh uslovij pri čerenkovanii kornej barhata. **[The importance of temperature for root cuttings of *Phellodendron amurense*.]** *Lesn. Hoz.* 11 (9), 1958 (78). [Russ.]

In trials in frames and under laboratory conditions it was found that with root cuttings 5 cm. long, soil temperatures can be as high as 30–35° C. until shoots form, provided that watering is adequate.

After shoot formation, but before rootlet formation, temperatures should be 20–25°. After rootlets have formed, soil temperature is not of great significance.

1722. CIAMPI, C., and GELLINI, R. Studio anatomico sui rapporti tra struttura e capacità di radicazione in talee di olivo. **[An anatomical study of the relation between structure and rooting capacity of Olive cuttings.]** *Nuovo G. bot. ital.* (*n.s.*) 65 (3), 1958 (1959), (417–24). 11 refs. [It.it.e.] A.P.B.

Study of a number of different types of Olive cutting revealed that a relation existed between rooting capacity and the presence of a ring of sclerenchymatous tissue between the inner and outer bark, in the sense that the discontinuity of such a ring favours, and its continuity inhibits, the formation of adventitious roots.

1723. NORD, E. C. **Bitterbrush plants can be propagated from stem cuttings.** *Res. Note Pacif. Sthwest. For. Range Exp. Sta.* No. 149, 1959. pp. 4.

Purshia tridentata cuttings taken from field or greenhouse plants and treated with 0·1% IBA, rooted to > 50%. *P. glandulosa* cuttings callused but did not root.

1724. GÜNTHER, H. Die Abhängigkeit des Stecklingertrages von der Verbandsweite, der Länge der Ausgangsstecklinge und der Rutenzahl am Wurzelstock bei der Anlage von Pappelmutterquartieren. **[The influence of spacing, length of original cuttings and the number of shoots per stool on the yield of cuttings in Poplar stool-beds.]** *Wiss. Abh. Dtsch. Akad. LandwWiss., Berl.* No. 40 (*Beitr. Pappelforsch.* No. 3), 1959 (7–80). 11 refs. [G.g.e. russ.]

Reports on trials at Graupa Central Nursery on slightly loamy sand, chiefly with *Populus* × *robusta*. Number of cuttings per stool increased with spacing, but number per unit area decreased. In the interests of cultivation, a spacing of 50–60 cm. between and 30–40 cm. within rows is recommended. The highest yields were from stools grown from the longest cuttings (21–30 cm.). Thinning of shoots had little influence on their yield, but improved their size and quality, 3–9 shoots per stool being recommended for similar sites. Yield varied considerably from year to year and between clones.

1725. TARIS, B., and CHARDENON, J. Quelques remarques sur l'action du chlorure de méthoxyéthyl mercure (3·5% de mercure, 0·6% de chlore) sur l'activité cambiale et le développement des boutures de *Populus*. **[Some remarks on the action of methoxyethylmercuric chloride (3·5% Hg and 0·6% Cl) on cambial activity and growth in Poplar cuttings.]** *C.R. Acad. Agric. France* 45 (6), 1959 (280–1). [F.] A.P.B.

Further investigations into the stimulating effect of this fungicide on cuttings of *Populus* × *canadensis* and *P. deltoides* [cf. *F.A.* 20 No. 4478] revealed the development of undifferentiated callus tissue on treated cuttings.

1726. JENKO, V. Vegetativno razmoževanje sivega topola. **[Vegetative propagation of *Populus canescens*.]** *Gozd. Vestn.* 16 (2/3), 1958 (51–6). 5 refs. [Sloven.]

A short, illustrated, general account, based mainly on German literature [cf. *F.A.* 19 No. 4122].

1727. SUSZKA, B. Mnożenie topoli z sekcji *Leuce* Duby z sadzonek zielnych uzyskanych przez podpędzanie korzeni. **[Propagation of Poplars of the Section *Leuce* by shoots from forced root cuttings.]** *Sylwan* 103 (9), 1959 (45–57). 8 refs. [Pol.russ.e.]

Populus tremula × *P. tremuloides*, *P. alba* × *P. tremula*, and *P. tremula* × *P. alba* hybrids were propagated from root cuttings by Schröck's method [cf. *F.A.* 19 No. 4123; 20 No. 3105], with the modification that the rooted shoots were transplanted into small pots instead of into frames, and a few weeks later, when hardened, were put out into beds.

1728. NIENSTAEDT, H. **The effect of rootstock activity on the success of fall grafting of Spruce.** *J. For.* 57 (11), 1959 (828–32). 13 refs.

By manipulating photoperiod and temperature in a greenhouse, 2-year-old rootstocks of *Picea abies* and *P. glauca* varying in their degree of growth activity were obtained. *P. glauca* scions were veneer-grafted to these stocks in September. Graft survival was high, 70–100%, and was affected by rootstock treatment only in a few special cases. Various photoperiods and temperature treatments after grafting did not affect survival, but had a considerable influence on scion activity and total growth. The best treatment after grafting was 4 weeks of long days, followed by 2 weeks of short days, then 8 weeks' chilling, and finally long days. The responses of the two rootstock species to chilling and photoperiod, and other aspects of dormancy and growth, were observed and are discussed.

1729. HOLLIER, H. F. **A simple method of grafting Monterey Pine.** *Aust. For.* 23 (1), 1959 (49 + 1 photo).

A simple, quick technique has been developed for making side bottle-grafts of *Pinus radiata*. The scion is held to the stock by means of a 2½-in. 'Bull-dog' paper clip, and the union left exposed. The jaws of the clip are lined with rubber to prevent damage to the bark. Greenhouse grafts made by this method (illustrated) gave 90% success in 1958.

1730. ORR-EWING, A. L., and PRIDEAUX, D. C. **Grafting methods for the Douglas Fir.** *For. Chron.* 35 (3), 1959 (192–202).

Dormant scions of Douglas Fir can be collected in winter or early spring either by climbing or by shooting off branches with a rifle. They are stored until the rootstock is in an actively growing condition and are then grafted, either in the greenhouse or outside. Cleft and crown veneer graft methods (illustrated) have been found most suitable for this species. The possibilities of early cone production after grafting are promising. *From authors' summary.*

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

See also No. 1438.

1731. **Growing planting stock in tubes in the greenhouse.** *Extr.* from *Rep. For. Res. Glendon*

Hall Fac. For. Univ. Toronto 1958/59, 1959 (9–11).

Reports preliminary trials in which a number of species were grown in the greenhouse under highly favourable conditions with a view to reducing the period between sowing and planting out to < 12 months. Essential elements were provided in a solution which was added to the medium, and day-length was extended artificially to 20 hours. The seedlings were grown in (*a*) plastic tubes (diam. 2–5 cm., ht. 22 cm., vol. of medium 100 ml.), (*b*) cylindrical metal containers (vol. of medium 300 ml.), or (*c*) wedge-shaped containers (100 ml.). The medium was either perlite or pulverized sphagnum. All seedlings were planted out during the growing season. Many species grew exceptionally well; these included all the hardwoods (*Acer saccharinum*, *Betula lutea*, *B. papyrifera*, *Ulmus americana*, and *Gleditsia triacanthos*), and two of the conifers (*Larix laricina* and *Thuja occidentalis*). *Picea* spp. also gew well, reaching heights of up to 40 cm. in 180 days; *P. mariana* was tallest, *P. abies* the stoutest, and *P. glauca* intermediate. *Pinus* spp. were disappointing; *P. banksiana* and *P. sylvestris* were only ca. 10 cm. high though fairly stout, *P. strobus* and *P. resinosa* were poor. The seedlings in the larger containers grew faster, but with 20 cm. of depth, 6 sq. cm. provides enough space to raise the seedlings to transplant size. Root systems developed well and formed a coherent mass with the medium, especially with the sphagnum, which was left adhering to the roots during transplanting, and protected them from drying and from mechanical injuries. Growth after planting out was highly satisfactory, even for seedlings transplanted in mid-summer during a dry period.

1732. GIORDANO, E. L'azione dell'acido gibberellico su semenzali di *Eucalyptus camaldulensis* Dehn. **[The action of gibberellic acid on young plants of *E. rostrata*.]** *Pubbl. Cent. Sper. Agric. For., Roma* 2, 1959 (147–56 + 2 plates). 21 refs. [It.it.e. *e*.] [Cf. *F.A.* 20 No. 1754.]

232.33. Formation of Stands by Direct Sowing

See also Nos. 1322, 1641, 1755, 1808, 1842.

1733. STOECKELER, J. H., and SKILLING, D. D. **Direct seeding and planting of Balsam Fir in Northern Wisconsin.** *Sta. Pap. Lake St. For. Exp. Sta.* No. 72, 1959. pp. [1] + 22. 5 refs.

In trials on various sites with different soil preparation etc., direct sowing resulted in fair stands on a few sites with moderate overhead cover of Aspen/Birch or scattered northern hardwoods, or with shallow water-tables, but, in general, results were poor. Though plantings of 2 + 2 or 4 + 0 Balsam Fir were all successful, Balsam Fir was inferior in survival and height growth to White Spruce where this was planted for comparison. *From authors' summary.*

1734. CAYFORD, J. H. **Seeding Jack Pine on the Sandilands Forest Reserve, Manitoba, 1925 to 1955.** *Tech. Note For. Br. Can.* No. 79, 1959. pp. 16. 5 refs.

Direct sowing on scarified ground at ca. 8–12 oz. viable seed per acre has proved a satisfactory method of regenerating Jack Pine in this area. Neither scattering of cones nor sowing in furrows was successful.

1735. STIELL, W. M. **Seeding and planting Red and White Pine.** *Tech. Note For. Br. Can.* No. 80, 1959. pp. 19 + 1 map. 44 refs.

A consolidated account of available information on the establishment of *Pinus resinosa* and *P. strobus*, by planting or direct sowing, in the Great Lakes/St. Lawrence forest region, based on the literature and on field studies specially undertaken for the project.

1736. DERR, H. J., and MANN, W. F. **Guidelines for direct-seeding Longleaf Pine.** *Occ. Pap. Sth. For. Exp. Sta.* No. 171, 1959. pp. 22. 21 refs.

Discusses all major aspects, choice and preparation of site, seed, seed hazards and protection by repellents, rates, season, and methods of sowing, evaluation of results and early tending, including brown-spot control, on the basis of research and field trials in Central and Southwest Louisiana. [Cf. *F.A.* 16 No. 4035; 19 No. 4134.]

1737. HUSS, E. Om sådd- och täckningsdjup och några jämförelser mellan spårsådd och myllsådd. **[Depth of sowing and covering, and comparisons between sowing in drills and broadcast sowing with light raking in of the seed.]** *Svenska SkogsvFören. Tidskr.* 57 (3), 1959 (415–24). 8 refs. [Sw.]

Describes chiefly experiments with Pine (on burnt and unburnt sites) and Spruce (unburnt only) supplementary to Tirén's series [cf. *F.A.* 15 No. 3518]. Sowing in covered drills made in the middle of planting patches (*a*) resulted generally in higher plant % than broadcast sowing on prepared patches with subsequent raking-in (*b*), particularly in loose or dry soils. Mortality was greater in (*a*) and the resulting unstocked patches about equal. It is thought that (*a*) may be able to save considerable amounts of seed on suitable sites. Experiments on covering indicate that a cover of 5–8 mm. of mineral soil is generally the best, and that poor seed was more adversely affected by too much cover than good.

1738. KRAVČENKO, V. I. Kul'tura fistaški na bogare. **[Growing *Pistacia vera* by direct sowing without irrigation.]** *Lesn. Hoz.* 11 (7), 1958 (31–3). [Russ.]

Describes the climate of (*a*) Kushka and the Badkhyz forest reserve, both in Turkmenistan, and (*b*) Katta-Kurgan, near Samarkand, Uzbekistan, and the formation and progress of the plantations there. Plantations at (*a*) are 1–23 years old, and at (*b*) 1–9 years; they are doing well at both sites.

1739. IL'IN, G. P. Sejalka dlja poseva želudej. **[A drill for acorns.]** *Lesn. Hoz.* 11 (8), 1958 (60–1). [Russ.]

Describes the mechanism of a landwheel-driven, tractor-drawn drill, designed by the author, which deposits acorns in seed spots at predetermined spacing.

232.4. Formation of Stands by Planting

See also Nos. 1322, 1641–2, 1733, 1735, 1808.

1740. **Field planting. Effects of stock treatment upon field survival.** *Tree Plant. Notes* No. 36, 1959. pp. 23.

The issue contains short reviews of 3 publications of tree-planting interest, a sample tree-planting contract form, and several very brief articles by different authors on field planting and field survival.

1741. KAPUSTINSKAJTE, T. K. Kultury černoj ol′hi v Litovskoj SSR. [***Alnus glutinosa*** **plantations in Lithuania.**] *Lesn. Hoz.* 11 (10), 1958 (36–7). [Russ.]

Discusses planting methods, spacing, and the performance of the plantations, some of which are ca. 60 years old.

232.41. Planting Stock (Type, Handling and Treatment)

See also Nos. 1752–3, 1807, 1809, 2083.

1742. PUDDEN, H. H. C. **Report on silvicultural research for the year 1958. Seedling quality.** *Extr.* from *Rep. For. Dep. Kenya 1958*, 1959 (13).

The criterion of plant quality in a long series of nursery experiments on soil mixtures, fertilizers etc., in Kenya and elsewhere, has been height. In a nursery spacing trial, the subsequent growth of seedlings proved to be unrelated to nursery height but significantly related to the mean area allotted to each plant. Visual inspection at the time of planting out was sufficient to place the tallest plants, grown at close spacing, in an inferior grade.

1743. SPIEGELHAUER, R. Überdurchschnittlicher Anwuchs bei Wildlingspflanzung durch Pflanzenvorbehandlung. [**Above-average survival of planted wildings as a result of pretreatment.**] *Forst u. Jagd* 9 (9), 1959 (424–6). [G.]

Describes the successful transplanting of Spruce wildings from over-dense natural regeneration under semi-shade to an open reforestation area that had been ploughed up, after a period of heeling in for 2–3 weeks, or storing in ditches with their roots in water, combined with root pruning.

1744. SLOCUM, G. K., and MAKI, T. E. **Exposure of Longleaf Pine planting stock.** *J. For.* 57 (11), 1959 (825–7). 4 refs.

One-year-old *Pinus palustris* stock was exposed to direct sunlight (73°–80° F.) for 0, 45, 90 and 180 minutes, in tests in N. Carolina. Half the stock had the roots puddled in clay mud before exposure; the rest were handled according to normal practice, leaving the roots bare. Survival during the next growing season indicated that large stock (averaging $\frac{1}{4}$ in. in groundline diam., and > 3 g. oven-dry) was superior to small stock ($\frac{1}{8}$–$\frac{3}{16}$ in. diam., < 1·5 g.) in withstanding direct exposure. Almost any duration of exposure is probably harmful, but with larger stock and puddled roots, first-year survival rates are acceptable for exposures of 30 min. or longer. Even after 3 hr., survival of large stock averaged > 50° at the end of the first growing season. Clay-puddling appears to be a simple and inexpensive guard against injury from chance exposure during planting. *From authors' summary.*

232.42. Methods of Planting (including Use of Fertilizers etc.)

See also Nos. 1761, 1809, 1842.

1745. PRUETT, E. **Mulch around newly planted trees can be detrimental.** *Sta. Note Cent. St. For. Exp. Sta.* No. 132, 1959. pp. 2.

In a planting trial in which one row of each of 10 species was mulched with 1·5 cu. ft. of sawdust per plant, spread in a 3-ft. circle, the mulching, presumably owing to the openings thus created in the surrounding rank weed growth, greatly increased damage by rabbits, particularly to Norway Spruce, Green Ash, Red Oak, and Yellow Poplar.

1746. WILLIAM, H. W., JR. **Potato stick seedlings.** *J. For.* 57 (11), 1959 (853).

After heavy rains had made an area harrowed for planting resemble a rice paddy, as a last resort planting was done with a farmer's potato stick (4 ft. long with a notch cut into the small end). The seedlings were placed on the ground, the end of the tap root caught by the notch, and the seedlings then gently pushed into the soft earth, tamping being done by foot. Survival was ⩾ 80°, and height growth and vigour were good.

1747. NOVOTNÝ, M. Ekonomika práce přenosného motorového jamkovače VÚ/56. [**The economics of work with the VÚ/56 portable plant-hole borer.**] *Práce Výzkum. Úst. Lesn. ČSR* No. 16, 1959 (137–59). 6 refs. [Cz.russ.g.]

Tabulates extensive trial data proving, *inter alia*, that work with this Czech-made hole-borer was easier, quicker and cheaper than hand labour.

232.43. Spacing and Arrangement in Plantations

See also Nos. 1635, 1772, 1785.

1748. TIMOFEEV, V. P. Opyt vyraščivanija listvennicy pri raznoj gustote posadki. [**Growing Larch at different planting densities.**] *Izv. Timirjaz. Sel.′-hoz. Akad., Moskva* No. 2, 1959 (123–40). 21 refs. [Russ.] O.W.

One-year seedlings of Siberian Larch were planted at regular spacings giving densities of 25, 50, 100 and 200 plants/sq. m. in 1947. The mortality, and mean, max. and min. heights are tabulated for each density annually up to 1957, and the stem form, root-collar diameter, plant weights etc. shown at 12 years. The total air-dry weight of material produced on the plots during the trial was 35·25, 25·78, 19·15 and 20·18 kg./sq. m. respectively for the four densities, and the numbers of trees still living in 1957 were 13, 17, 16 and 21/sq. m. Similar results were obtained from a trial started in 1954 with 2-year stock of Siberian Larch, Scots Pine, Spruce and *Tilia grandifolia* planted at 4, 12, 24, 48 and 100 plants/4 sq. m. The manifold adverse effects of very dense planting are discussed.

1749. KONDRAT′EV, P. S. Novye dannye nabljudenij za rostom sosnjakov raznoj gustoty.

[New data on the growth of Pine plantations at different densities.] *Izv. Timirjaz. Sel.'hoz. Akad., Moskva* No. 2, 1959 (141–54). 7 refs. [Russ.russ.e.] O.W.

Trial plots of *Pinus sylvestris* were established in 1879 at 2361, 4447 and 9387 plants/ha., and in 1901 at 8 different densities ranging from 2233 to 22,830 plants/ha. Data are tabulated on mortality and mean heights and diameters at several ages up to 1956, and also on the rate of canopy closure. Results indicate that on these sod-podzolic sites, the optimum planting density is 4000–5000 plants/ha.

1750. Reukema, D. L. **Some recent developments in the Wind River Douglas Fir plantation spacing tests.** *Res. Pap. Pacif. Nthwest. For. Range Exp. Sta.* No. 167, 1959. pp. 7. 1 ref.

Reports some results of a remeasurement made in 1957 of plots established in 1925 [cf. *F.A.* 16 No. 4051]. Most of the trends revealed are similar to those reported previously, i.e. total height, dominant and co-dominant height, and merchantable volume in board feet were greatest at the widest spacing.

1751. Cozzo, D. El crecimiento del álamo negro (*Populus nigra* cv. '*italica*') en Alto Valle del río Colorado y del río Limay, Argentina. **[Growth of *P. nigra* var. *italica* in the upper reaches of the rivers Colorado and Limay, Argentina.]** *Rev. for. argent.* 3 (3), 1959 (88–100). [Span.]

In the province of Río Negro, Poplars are planted mainly for protection along irrigation canals, but occasionally also as forest stands. Even in the latter, however, the same spacing and arrangement are followed as along the canals, i.e. double rows, 1 m. apart on both sides of a 'canal' (an unplanted strip 8–20 m. wide) with the trees 1–1·5 m. apart in the rows. Studies were made of growth and increment in a total of 22 plots in 4 stands in this region. M.a.i. reaches its maximum in the 6th year, after which stagnation gradually sets in. Thinnings are therefore necessary from the age of 5 years onwards, removing all trees $<$ 5 cm. d.b.h. and all undesirable trees of 5–10 cm. d.b.h., i.e. probably 30–40 % of the original stand. The author condemns this pattern of planting and suggests that, if it must be followed, the spacing between both trees and rows should be 2 m., in which case early thinnings will not be needed. He recommends orthodox planting of the whole terrain at 2 × 2 m. (2,500 trees/ha.), with early thinnings, or else 3 × 2 m. (1,666 trees/ha.), which would probably not entail thinnings if the rotation were 9–10 years.

232.44. Season and Time of Planting

1752. Stone, E. C., and Schubert, G. H. **Root regeneration of Ponderosa Pine seedlings lifted at different times of the year.** *For. Sci.* 5 (4), 1959 (322–32). 30 refs.

In 1955–56, 2 + 0 Ponderosa Pine were lifted each month from the nursery, replanted in the greenhouse, and examined after 30 days for new roots. The seasonal periodicity of both (*a*) root elongation and (*b*) root initiation in transplanted seedlings was evident under greenhouse conditions of ample soil moisture and nutrients, and constant soil and air temperatures (the latter never $<$ 20° C. at night). In general, (*a*) and (*b*) did not occur in seedlings transplanted into the greenhouse in July and August; at all other times, (*a*) was evident, but (*b*) only on seedlings transplanted from December to June, maximum activity occurring just before the terminal bud broke in spring. The data obtained suggest that the seed-collection zone and/or the nursery in which the seedlings are raised affect their physiological condition and subsequent response when transplanted. Since more short laterals per unit time elongate in spring than in autumn, and a large % of spring-lifted seedlings initiate new laterals, roots that dried out and died during transplanting can be replaced, and the seedlings can regenerate a new root system at a lower soil temperature than in autumn. [Cf. *F.A.* 20 No. 4460.]

1753. Stone, E. C., and Schubert, G. H. **The physiological condition of Ponderosa Pine (*Pinus ponderosa* Laws.) planting stock as it affects survival after cold storage.** *J. For.* 57 (11), 1959 (837–41). 12 refs.

Plants (1 + 1, from seed from 4 different collection zones) were lifted every 15 days from Sept. 15th to Dec. 1st, root-pruned, and planted in the greenhouse ($\nless$ 20° C.) either immediately or after 1, 2 or 3 months' storage at 1° C. After 30 days in the soil they were again lifted and any new root growth was recorded. Plants lifted and placed in cold storage early in the autumn did not survive when replanted in the greenhouse; but almost all those lifted after Nov. 1st survived. Cold storage generally reduced the number of short lateral roots (stubs) that elongated during the first month after replanting in the greenhouse, the reduction being most pronounced with plants lifted and cold-stored before Nov. 1st. Both survival and lateral-root elongation of stock lifted and cold-stored before Nov. 1st were correlated with the seed-collection zone.

232.5. Artificial Formation of Stands by Vegetative Propagation

See No. 1393.

233. Afforestation

See also Nos. 1393–4, 1520, 1534, 1652, 1800, 2243.

1754. Lokvenc, T. Historie zalesňování nad horní hranicí lesa v Krkonoších. **[The history of afforestation above the limit of forests in the Krkonoše Mts.]** *Práce Vyzkum. Úst. Lesn. ČSR* No. 15, 1958 (151–66). 19 refs. [Cz.russ.g.]

An account of the afforestation from 1870 to 1916 of $>$ 300 ha. at 1300–1400 m. alt. (forest limit 1200–1250 m.). Species used were *Picea abies*, *Pinus cembra* and *Pinus mugo* vars. *vindelica*, *austriaca* and *gallica*, in planting holes at 5 × 5 m. The reasons for the failure of the plantations are discussed, and the importance of these lessons for current afforestation schemes is stressed.

1755. McVean, D. N. **Ecology of *Alnus glutinosa* (L.) Gaertn. VII. Establishment of Alder by direct seeding of shallow blanket bog.** *J. Ecol.* 47 (3), 1959 (615–8). 4 refs.

Experiments in Ross-shire indicate that Alder can be successfully established by direct sowing in acid bog vegetation, particularly where there is some irrigation with peat-free water. P fertilizer is essential, and the use of an inoculum of crushed nodules is advisable on the more acid sites. Ground preparation is not required, so that this may provide a rapid method of afforestation for such sites.

1756. LIEBIG, K. Der rheinische Braunkohlenbergbau. [**Soft coal mining in the Rhineland.**] *Holz-Zbl.* 85 (130), 1959 (1736–7). [G.]

A general discussion of land use etc., including a report on the results of afforestation of spoil-mounds, some of it ca. 20 years old. In general conifers were not satisfactory, but Robinia and Poplars did well, and proved good stabilizers, the latter particularly if mixed with Robinia or Alder, and if planted while the mounds still retained a loose texture with good penetrability for roots and high water retention.

1757. MORGENEYER, W. Düngungsversuche an Pappeln unter Verwendung eines Braunkohle-Torf-Gemisches. [**Fertilizer trials on Poplars with a mixture of lignite and peat.**] *Wiss. Abh. Dtsch. Akad. LandwWiss., Berl.* No. 40 (*Beitr. Pappelforsch.* No. 3), 1959 (81–133). 6 refs. [G.g.russ.e.]

Reports on trials supplementary to those previously described [see *F.A.* 18 No. 4020], with the same varieties, and later observations of the original field trials. Conclusions are broadly similar, but 5 years after establishment, height differences between plants treated with the lignite/peat mixture, limed plants and controls were not significant.

1758. DE, B. N. **Reclamation and fixation of sand dunes and other shifting sands.** *W. Bengal For. Bull.* No. 4, 1957. pp. 33 + 15 photos. 51 refs.

A general review of methods employed in different regions of the world.

1759. KVEDARAS, A., *et al.* [Editors]. Smėlynų sutvirtinimo ir apmiškinimo klausimai. [**Sand fixation and afforestation.**] Lietuvos Miškų Ūkio Mokslinio Tyrimo Institutas, Vilnius. 1957. pp. 251. Many refs. [Russ.lith.]

Collected papers of a conference held in Klaipeda, Aug. 1955, in Russian, with Lithuanian versions or summaries: Soil moisture content and its significance in afforestation and utilization of sands (*A. G. Gael′*); The fixing and afforesting of coastal sands in Lithuania (*M. Daujotas*); Sandy soils of the Poles′e and their use for forestry (*I. D. Jurkevič* and *L. P. Smoljak*); Afforestation of dune sands in Latvia (*M. Buš*); The natural growth of vegetation on the sands of the Lower Dnieper region, and methods of fixing the sands (*I. I. Gordienko*); Methods of afforesting the Lower Dnieper sands (*G. M. Il′kun*); Afforestation of the sands to the W. of the River Don (*I. S. Matjuk*); Afforestation and fixing of sands on the Nerija spit of the Primor′e leskhoz in Kaliningrad region (*V. A. Jakimov*); Afforestation of coastal sands in Lithuania, 1945–55 (*J. Paulauskas*); The dunes of the Kurš Nerija spit, and some investigations on wind dynamics (*V. Gudelis*); On the origin and distribution of sandy areas in Lithuania (*V. Čepulyte*); Microclimatic features of the Nida region (*A. Griciūte*).

1760. ISAČENKO, H. M. Primenenie vejmutovoj sosny dlja oblesenija peskov. [**The use of *Pinus strobus* for afforesting sands.**] *Lesn. Hoz.* 11 (7), 1958 (78). [Russ.]

In 1925–30, some 750 ha. of sands in the Voronezh area were fixed with *Salix acutifolia* var. *caspica*, and *Pinus sylvestris*, *P. strobus*, Birch, etc., were planted. In 1936–38, considerable mortality of *P. sylvestris* was noted in the S. part of the area, where the sand had earlier been most mobile, but *P. strobus* still appeared to thrive. In 1957, the stocking was *P. strobus* 182·3 (in 5072 trees), *P. sylvestris* 27·7 cu. m. (292 trees) per ha., and m.a.i. 6·3 and 0·9 cu. m. respectively.

1761. MAY, S. La tenuta agraria Nobili-Nichetti culla di un originale sistema di coltivazione del pioppo. [**The Nobili-Nichetti estate, cradle of an original system of Poplar-growing.**] *Cellulosa e Carta* 10 (9), 1959 (5–16). 4 refs. [It. g.e.f.]

Describes the planting of Poplars on barren sand-hills in the province of Rovigo. Planting stock consisted of rooted cuttings, cut back for one year, and grown on in the nursery for a further 2 years, so that the roots were 3 years and the shoots 2 years old. These were planted in auger holes made to varying depths up to 4 m. so as to reach ground-water level. Growth data are given on a number of plots of 'Canadian' Poplar aged 1 to 9 years. Root systems of trees aged 1, 3, and 5 years were excavated and are illustrated and discussed; a striking feature was the development of whorls of roots at different levels on the buried portion of the stem.

1762. GIORDANO, A. Nota pedologica sui terreni della Tenuta Nobili-Nichetti. [**A pedological note on the soils of the Nobili-Nichetti estate.**] *Cellulosa e Carta* 10 (9), 1959 (17–20). [It.f.e.g.]

Soil profiles were investigated, to determine the differences of soil, if any, between vigorous and poor Poplar stands on deep sands [see previous abstract]. Growth was found to be closely correlated with humus content.

1763. YOUNGBERG, C. T. **The influence of soil moisture on the survival of planted Douglas-Fir seedlings on clay soils.** *J. For.* 57 (11), 1959 (842–4). 9 refs.

[Cf. *F.A.* 17 No. 393.] Two clearings at 500 ft. alt. on W. exposures in the foothills of the Willamette Valley, Oregon, were planted up in 1955 and 1956 with 2 + 0 Douglas Fir. Soil moisture depletion and plant survival are graphed for both soil types: (1) silty clay-loam, a reddish brown latosol, and (2) soil similar to the climax clay soil, a grumosol. Results indicate that vegetative competition must be eliminated to assure any success in planting operations in the area. It is doubtful whether planting should be attempted at all on grumosols.

1764. MARRERO, J., and WADSWORTH, F. H. Indicaciones para la repoblación forestal de las fincas de Puerto Rico. [**The afforestation of agricultural land in Puerto Rico.**] *Carib. For.* 19 (3/4), 1958 [1959], (56–79). 5 refs. [Span.]

Discusses the need for afforestation, areas where degraded or abandoned agricultural land is available, soil types, species to be used, and seasons suitable for sowing or planting in different areas.

1765. BUDOWSKI, G. Algunas novedades en la reforestación de terrenos degradados. **[Recent developments in the afforestation of degraded land.]** *Bol. Inst. For. Latino Amer., Mérida* No. 3, 1959 (22–33 + 3 plates). 12 refs. [Span.span.e.]

A review, based on world literature since 1951, of the most recent developments in this field, with particular reference to savannas.

235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also Nos. 1520, 1594, 1621, 1646.

1766. SCHMITZ, A. Essais d'enrichissement et de griffage dans les parcelles d'extension de l'arboretum de Ruashi. **[Enrichment and marking trials in plots of the Ruashi extension of the arboretum [of Étoile, Belgian Congo].]** *Bull. agric. Congo belge* 50 (2), 1959 (329–64). 8 refs. [F.f.du.]

In 1927, enrichment trials were begun by introducing exotic and indigenous species on cleared plots. Poor results were obtained except with *Cupressus lusitanica* and *Callitris* sp., but the total protection from fire that these demand would be uneconomic. These plots, cleared again between 1949 and 1951, were thereafter used for marking trials. From an analysis of various treatments of the coppice regrowth, and the fact that, while any seed-trees left standing rapidly died, valuable species were found to coppice freely, it was concluded that the forest could best be improved by clear felling. Regeneration by selection coppice should be combined with annual prescribed burning until grasses are suppressed. A higher % of valuable trees was found where the coppice was dense, though stands must be thinned when samples show that increment is diminishing. From trials with Eucalypts it is concluded that they are unsuitable for the enrichment of natural forest, but may be grown as pure crops, either by retaining only Eucalypt regrowth after clear felling of mixed stands in which they have been introduced, or by direct sowing after scrub-clearing and burning on waste or unprofitable land (e.g. covered with ant-hills).

1767. ŽILKIN, B. D. Povyšenie produktivnosti sosnovyh nasaždenij s pomošč'ju soputstvujuščej kul'tury ljupina mnogoletnego. **[Increasing the productivity of Pine plantations by growing perennial lupin with them.]** *Vestn. sel'. hoz. Nauki, Moskva* 4 (7), 1959 (87–94). [Russ.e.g.f.] O.W.

Gives tabulated data from several sources on soil fertility, microclimate, lupin yields and Pine increment in young stands on various site types in Belorussia, with and without perennial lupins.

236. Care of Regeneration or Plantations in the Initial Stages of Establishment

See Nos. 1555, 1783–4, 1868.

237. Amelioration of Forest Sites

See also Nos. 1340, 1346, 1351, 1545, 1622, 1703, 1757, 1767, 1809, 1831, 2081, 2141.

1768. Sonderheft Forstdüngung. **[Special number: forest fertilizing.]** *Forst- u. Holzw.* 15 (1), 1960 (2–15 + 8 pp. of photos). Many refs. [G.]

Contains the following: Forest fertilizing (*H. Baule*) [a general account]; Mobilization of H_3PO_4—a side-effect of NH_3 fertilizing (*R. Themlitz*) [tests on Pine seedlings]; P and K fertilizing in the forest (*S. Gericke*) [reviews results of trials in stands of various ages and compositions]; Plant protection and fertilizing (*H. Mayer-Krapoll*) [discusses the control of e.g. needle-cast, by fertilizer application]; The appearance of nutrient deficiency symptoms in young Pines as a result of unbalanced fertilizing (*R. Themlitz* and *H. Baule*) [discusses cases of K deficiency following N or N + P fertilizing]; Forest fertilizing—results of older and more recent experiments (*D. Brüning*) [the effects of K and Mg on the development of Pines, Robinia and Red Oak in the N.E. German diluvium].

1769. THOMAS, J., and HARDING, J. H. **The effect of high-concentration nutrient solutions on *Pinus radiata* and *P. pinaster* in South Australia.** *Aust. For.* 23 (1), 1959 (61–2).

Records preliminary data on experiments in spraying young plantations from the air with high concentrations of $ZnSO_4$, P, N, and P + N at 3 gal./acre. In no case was any injury to foliage observed.

1770. BAUR, G. N. **Responses to phosphate, Barcoongere Plantation, N.S.W.** *Aust. For.* 23 (1), 1959 (12–8 + 5 photos). 3 refs.

A number of experiments have been made since 1946 in the application of P fertilizers to plantations of *Pinus taeda* and *P. elliottii* on P-deficient soils. Heavy dressings of superphosphate, up to 6 cwt./acre, were found necessary to overcome these deficiencies. Response to P occurred in stagnating stands up to 11 years old, but was faster in younger stands. *P. taeda* appeared to be more susceptible than *P. elliottii* to P deficiency.

1771. ZAHNER, R. **Fertilizer trials with Loblolly Pine in southern Arkansas.** *J. For.* 57 (11), 1959 (812–6). 9 refs.

In spring 1954, six fertilizer treatments were replicated 9 times in 4- to 8-year-old Loblolly plantations. The mean height and diameter growth of 20 trees in each replication were taken as the unit observations in analysis of variance. Chemical analysis of soil and foliage indicated the mineral uptake by trees in each treatment. Height growth was not affected by any treatment tested, but N fertilizer stimulated diameter growth for two growing seasons: 300 lb. N/acre gave better growth than 100 lb. in the second year but not in the first. The addition of P, K, or trace elements did not significantly increase growth over N alone. Foliar analysis showed that N, P, and K were taken up from fertilizers, the N in proportion to the quantity applied. The N content of needles from fertilized trees dropped to the same as controls after three years. Total 5-year diameter growth increase due to fertilizer was ca. 10% for a single application of 100 lb. N/acre. The more elaborate fertilizers did not significantly increase growth further, over the whole period. *From author's summary.*

1772. Heiberg, S. O., Leyton, L., and Loewenstein, H. **Influence of potassium fertilizer level on Red Pine planted at various spacings on a potassium-deficient site.** *For. Sci.* 5 (2), 1959 (142–53). 4 refs.

In continued experiments [cf. *F.A.* 12 No. 3346], plots established in 20-year-old *Pinus resinosa* plantations (4 × 4 and 6 × 6 ft. spacing) were fertilized in 1948 with 50–300 lb. KCl/acre. In 1957, mensurational data from these plots and from unfertilized trees indicated that on this marginal site, with this species, height of the tallest trees does not adequately indicate productivity. However, volume and dry-matter production per acre increased with an increase in fertilizer. Analysis of one tree from each plot indicated, by extrapolation, that K uptake on the most heavily fertilized plot was 70 lb./acre higher than that of the control. In general, the foliage accounted for > 50% of the total N, P and K in the tree, the branches 20–30%, bark ca. 10%, and the stem wood 10–20%. The removal of stem + bark would entail a loss to the site of 35–70 lb. N, 5–6 lb. P, and 10–25 lb. K/acre. This could be expected to increase as the stand matures.

1773. Brüning, D. Ein Beitrag zur Anwendung von Handelsdüngemitteln im Kiefern-Baumholz. **[The use of commercial fertilizers on mature Pine.]** *Forst- u. Holzw.* 14 (24), 1959 (523–6). 2 refs. [G.g.]

From spring 1954 to 1958, the following fertilizer treatments were applied on plots to assist 1-year-old Red Oak seedlings planted out in 1954 below residual 95- to 100-year-old Pine: (1) control, (2) NPKCa, (3) NPCa, (4) PKCa, (5) Ca. In 1959, some of the Pine trees were removed, and stem disks examined to see whether the treatments had had any effects. During the observation period diameter increments decreased by 5·6% in (1), but increased with all the other treatments. With (2) the diameter increment was 23·5%, with (4) 11·3, with (3) 10·1, and with (5) 7·4 more than that of the 5-year period immediately before the fertilizer treatment, the increases for (2) and (4) being statistically significant. Certain other definite but not significant tendencies are noted and discussed.

1774. Contant, P. Essais de fumure sur peupliers. **[Fertilizer trials in Poplar plantations.]** *Potasse, Mulhouse* 31 (249), 1957 (199–202). [F.] A.P.B.

The apparent success of complete fertilizer in checking *Dothichiza populea* attack and increasing growth in *Populus* × *robusta* plantations was examined by statistically designed fertilizer experiments in young *P.* × *robusta*, and *P.* × *robusta*/*P. deltoides virginiana* plantations. Height and diameter increment are graphed for two years after the fertilizer application, during which time no *D. populea* attacks were noted. The best growth results were given by 10/10/20 or 8/16/16 fertilizer at 2 kg./tree.

1775. McAlpine, R. G. **Response of planted Yellow-Poplar to diammoniumphosphate fertilizer.** *Res. Note Stheast. For. Exp. Sta.* No. 132, 1959. pp. 2. 2 refs.

First-year observations on 1 + 0 *Liriodendron tulipifera* seedlings planted in a small stream bottom in Georgia, considered a medium to good site though poor in N, P, K and Ca by agricultural standards, showed marked response in height growth to a special $(NH_4)_2HPO_4$ fertilizer (20–52–0), prepared by the T.V.A. Applications of 500 and 1000 lb./acre gave significantly better height growth than 250 lb. but did not differ significantly between themselves.

1776. Materna, J. Metabolismus síranu amonného ve smrkovém humusu. **[The metabolism of $(NH_4)_2SO_4$ in Spruce humus.]** *Práce Výzkum. Úst. Lesn. ČSR* No. 16, 1959 (7–21). 8 refs. [Cz.cz.russ.g.]

In laboratory experiments, (1) $CaCO_3$ and (2) $(NH_4)_2SO_4$ were added to humus, together and alone. The breakdown of humus was reduced by (2), and addition of (1) did not stop this effect. It could not be shown that (1) accelerated the breakdown of humus. All the N added to the humus, and some of the N already in it, was leached out, so that the N content was finally less than in the untreated control. The addition of (1), however, reduced the amount of nitrates leached out. In the control, 20% of the N originally present in the humus was lost; with addition of (1) only 18·6%; with (1) + (2), 6·21%; and with (2) only, 3·71%. Leaching of S was not affected by (1). In a field trial, where (2) was spread on the litter in a Spruce stand, it appeared that in a year's time > 90% of the N applied was taken up by the roots, and the remainder leached out. [Cf. *F.A.* 18 No. 1229.]

1777. Jüttner, O. Die Wirkung einer Kalkung silikatarmer, rohhumusbedeckter, diluvialer Sande. **[The effect of liming diluvial sands low in silicates and covered with raw humus.]** *Forst- u. Holzw.* 14 (18), 1959 (404–5). [G.]

Reviews the results of liming in a pole-stage Spruce stand, an old Beech stand, and an old Spruce stand. The value of the liming in transforming the raw humus and thus in improving the stands and assisting natural regeneration was clearly seen.

1778. Haritonova, R. G. Opyt limannogo orošenija polezaščitnyh lesnyh polos Pravoberež'ja Volgi. **[Experimental spring-flood irrigation of shelterbelts on the right bank of the Volga.]** *Izv. Timirjaz. Sel'.-hoz. Akad., Moskva* No. 2, 1959 (155–64). [Russ.e.] O.W.

Spring-flood irrigation involves soaking the soil once every year by retaining the snow-melt water on it by means of earth banks surrounding the area on three sides [cf. *F.A.* 18 No. 412]. Use was made of this technique in shelterbelts of *Quercus robur* and *Betula verrucosa* in 1953–56 in the Saratov region of the U.S.S.R. Improvement in height growth over that on dry control plots became evident in the second growing season after irrigation was started, and in 1956 the mean height increment of the Birch was 47·36 cm. greater than on controls. Details of labour and costs in constructing the irrigation system by tractor-grader and horse-drawn scraper are given.

238. Timber Plantation Crops requiring Special Treatment

See also Nos. 1623–4, 1801.

1779. HRISTOSKOV, N. Našijat opit po zalesjavane s topoli po porečieto na Dunav. **[Experiment on afforestation with Poplars along the banks of the Danube.]** *Gorsko Stopanstvo* 14 (4), 1958 (26–30). [Bulg.]

Afforestation in the last 30 years has been mainly with *Populus × canadensis*, *P. × serotina* and *P. × marilandica*, and also with *P. × regenerata* and *P. prjewalskii*. Data on total areas planted, and areas by age classes are given for the various regions, and the height and diameter increment discussed.

24. Tending of Stands and Trees

See also No. 1868.

1780. STIELL, W. M. **Intermediate cuttings in Red and White Pine plantations.** *Tech. Note For. Br. Can.* No. 81, 1959. pp. 27. 69 refs.

Consolidates the information available in the literature, previously unpublished work by the Forestry Branch, and the results of field studies specially undertaken for this project, on pruning, thinning, and release, in plantations of *Pinus resinosa* and *P. strobus*.

1781. BECKING, J. H. De fijnspar in Nederland. **[*Picea abies* in the Netherlands.]** *Ned. Bosb. Tijdschr.* 31 (12), 1959 (346–51). 7 refs. [Du.]

Discusses its present use, with figures for area, price, etc., gives data for some thinning plots established in 1957 (including tabulated stemwood volume for 154 trees), discusses the economics of pruning, and compares the stem form of Norway Spruce and Douglas Fir.

1782. DEKATOV, N. E. Racionalizirovat′ ispol′zovanie listvenno-elovyh drevostoev. **[Rationalizing the utilization of broadleaved stands with [understorey] Spruce.]** *Lesn. Hoz.* 11 (12), 1958 (18–24). [Russ.]

In the N. European part of Russia, Aspen and Birch have invaded large areas of clear-felled Spruce, and have formed stands with a Spruce understorey originating from advance growth. The increment of Spruce with and without overhead release in these stands is graphed, and the following recommendations made: (1) in young stands, thinning to favour the Spruce should be done between 10 and 20 years of age; (2) in 30- to 50-year stands the broadleaved species should be cut out in 2 or 3 operations, retaining the Spruce; (3) in 50- to 70-year stands the large defective Aspen should be girdled or poisoned some years before felling; (4) in unthinned stands of > 70 years the understorey Spruce should be felled with the broadleaved species.

1783. VESTJORDET, E. Avstandsregulering: litteraturoversikt og noen foreløbige resultater av norske forsøk. **[Early regulation of spacing: a review of literature and some preliminary results of Norwegian research.]** *Tidsskr. Skogbr.* 67 (2), 1959 (59–82). 34 refs. [Nor.nor.g.]

The term *avstandsregulering* is defined as 'the reduction of tree numbers early in a stand's development, to allow as many as possible of the remaining trees to reach minimum merchantable dimensions by the first thinning'. The literature reviewed is mainly Scandinavian and German. Preliminary results, 3 and 4 years after the establishment of sample plots (18 for Pine and 19 for Spruce) in natural regeneration in eastern Norway in 1954–55, are given; at the beginning of the experiment, heights ranged from 0·5 to 4·5 m. and the number of trees from 10,000 to 100,000 per ha. Tabulated data show, for Pine and Spruce separately, spacing after regulation (1·2–3·2 m.), mean height when the experiment began [before regulation?], mean leader length before and after regulation, T % (leader length after regulation as a % of mean length before regulation), and the % mortality on control plots. Graphs show the T % during the 3–4 years after regulation. General preliminary conclusions are that height increment tends to fall for the first year or two after regulation, to increase rapidly for one year and then to decrease somewhat. Pine reacts more slowly and evenly than Spruce, and two young Pine plots showed no decrease in increment after regulation. A comparison of the growth of the 10 tallest trees and 10 of mean height from each plot showed that leaders of the former were some 25–30% longer. Damage to regulated plots, by snow, insects, and elk, caused little mortality but some reduction in increment and quality.

1784. Avstandsregulering i praksis og forsøk. **[Early regulation of spacing in practice and research.]** *Norsk Skogbr.* 5 (19), 1959 (522–4, 527). [Nor.]

Discusses the Norsk Forstmannsforening's visit to the forests of the Mathiesen-Eidsvold mill, including particulars of (1) their regeneration studies, (2) their experience with early regulation of spacing. (1) Results of natural regeneration studies in Hurdal in 1948, given in a graph, show a zero-square % of 60 after 10 years at altitudes > 450 m. and after 5 years at < 350 m., with expected final volume yields of respectively 75 and 90% of normal [cf. *F.A.* 16 No. 2046]. Studies in 1958 of all regeneration in Høvern district since 1945 showed that results of natural regeneration, with zero-square %s ranging from 55 to 70, were generally poorer than results from planting, and that further planting on about half the total area would be needed to obtain a volume yield of 80% of normal. (2) Early regulation of spacing [see preceding abstract] is being introduced, at the rate of 5000–6000 dekares per year since 1952 in an attempt to make 4000 out of the 7000 cu. m. of fuelwood cut annually, available to the woodworking industry, with a minimum top diam. of 5 cm. Once the system is fairly working, regulation of spacing will be carried out annually on ca. 1000 dekares, corresponding to the annual regeneration area, at a cost of Kr. 10,000 or 250 working days. On normal regeneration areas, 1–2 plants were removed for each one left. Leader increment on an area treated in 1954 at 11–13 years was below that of controls for the first two growing seasons, and well above it thereafter; the abnormally high increment is expected to decline to the normal within a few years. Areas should be treated when plants are 1 m. high, preferably in spring. The work is best carried out by a small gang on piece rates, which may vary from Kr. 5–6 to Kr. 20 per dekare. Cleaning axes or knives are used.

242. Thinning

See also Nos. 2198, 2201, 2504.

1785. SMITH, J. H. G. **Comprehensive and economical designs for studies of spacing and thinning.** *For. Sci.* 5 (3), 1959 (237–45). 19 refs.

A review of literature.

1786. BOROTA, J. Sú úrovňové prebierky v smrekových porastoch odôvodnené? **[Is crown thinning justifiable in Spruce stands?]** *Sbornik Vědeckých Prací Fakulty Lesnické, České Vysoké Učení Technické, Praha* No. 1, 1958 (87–94). 24 refs. [Slovak.russ.g.]

Reports investigations on the development and increment of trees in two stands of pure, even-aged Spruce (50 years, quality II–III; 60 years, III). It appeared that trees for the most part kept their position in the stand throughout their life. Analyses of 29 trees indicated that, from the point of view of volume production in pure, middle-aged Spruce, a heavy thinning in the lower storey gives the best results.

1787. FANTA, J. Vliv porostní výchovy na stavbu a odolnost smrkového kmene. **[The influence of thinning on the structure and wind resistance of Spruce stems.]** *Práce Vyzkum. Úst. Lesn. ČSR* No. 15, 1958 (121–48). 30 refs. [Cz.cz.russ.g.]

The distribution of annual diameter increment (a.d.i.) along the stem in relation to tree age, the fluctuations in annual-ring width at different stem heights, and the changes in the height/diameter (h/d) ratio in relation to age, were compared (1) in solitary trees, and in trees from stands where low thinning (2), and crown thinning (3) had been done. In (1), a.d.i. was distributed in a layer of fairly even thickness over the whole length of the stem, and was considerably greater at the root swelling; the h/d ratio was constant. In (2), a.d.i. was greatest in the crown, and the curve of the h/d ratio rose with age. In (3), until crown thinning was done, increment resembled that in (2) but afterwards a.d.i. was in a fairly uniform layer along the whole stem, the root swelling became more pronounced, and the h/d ratio began to decrease. Cross-section stress on stems in a wind was calculated and found to be greatest for (2), and least for (1), with (3) intermediate. It is concluded that crown thinning produces trees more resistant to wind breakage than does low thinning.

1788. CARBONNIER, C. Gallringsförsök i naturbestånd av tall i Norrbottens län. **[Thinning trials in natural Pine stands in Norrbotten.]** *Svenska SkogsvFören. Tidskr.* 57 (3), 1959 (367–85). 10 refs. [Sw.g.*g.*]

Presents recent enumeration data and value estimates for thinning series established between 1907 and 1924 in dense stands regenerated after a fire (described by Näslund in 1936). Total volume and increment were greatest in untreated stands, while the value of production, to date and anticipated, was greatest with the heaviest thinning.

1789. BOBRAKOV, L. N. O povyšenii produktivnosti nasaždenij pri rubkah uhoda v svežej dubrave. **[Increasing the yield of Oak/hardwood stands by thinning.]** *Lesn. Hoz.* 11 (7), 1958 (14–6). 2 refs. [Russ.]

Tabulates figures for standing volume, increment and mortality in stands [density not stated] of various composition (both natural and planted) on 7 permanent sample plots remeasured at intervals over periods of 19–30 years, their ages during these periods ranging from 15–35 to 75–95 years. In these stands, subjected to different grades and kinds of thinning, it appeared in every case that, within certain limits, the increment for the period increased, and mortality decreased, with increasing severity of thinning.

1790. KORPEL', Š. K otázke pozitívneho a negatívneho výberu pri výchove listnatých porastov. **[The problem of positive and negative selection in raising broadleaved stands.]** *Lesn. Čas.* 5 (5), 1959 (299–323). 24 refs. [Slovak.slovak.russ.g.]

Compares the changes in stand structure brought about by thinning with (*a*) positive, and (*b*) negative selection [cf. *F.A.* 20 No. 4555] in more or less pure untended stands of Oak (aged 25, 30 and 35 years) and of Beech (30–35 years). In the first thinning, (*b*) removed more of the standing volume than (*a*); the difference was greater, the longer the thinning was delayed, and was greater in Beech than in Oak. Differences in the volume marked for removal by different people at the same time and on the same plot were greater in (*a*) than in (*b*), because the markers retained different numbers of crop trees. The volume removed in two successive thinnings by (*a*) was more uniform than by (*b*). When thinning is so delayed, the first two thinnings should be a compromise, using both (*a*) and (*b*), but more of (*a*) than (*b*).

1791. LORNE, R. Étude quantitative sur les éclaircies dans les peuplements de chêne de qualité. **[A quantitative study of thinnings in high-quality Oak stands.]** *Rev. for. franç.* 11 (11), 1959 (746–68). [F.]

The author first discusses objections that have been raised to his proposals of managing Oak stands for production of high-quality veneer logs, particularly with reference to the practicability, or even the desirability of thinning such stands [cf. *F.A.* 18 No. 1606]. In order to obtain quantitative data, a study was made of a number of more or less even-aged stands growing in roughly similar conditions in the Forest of Bercé, the dominant storey consisting of ca. 80% Oak and 20% Beech. The proposed treatment would be to remove some Oak and all the Beech from the overstorey, while leaving the understorey substantially unchanged. A table is given showing, for ages 30 to 220, by 10-year intervals: height of dominants; number, d.b.h., and area occupied by dominant Oak crop trees; ditto for auxiliary species (excluding understorey); total area occupied by the stand; total of stems > 5 cm. d.b.h.; mean d.b.h., mean b.a., total volume, and estimated money value of dominants; number of stems, mean d.b.h. of Oaks, and total volume, to be removed in thinnings, number of thinning operations, and money value of products of thinning; total yield/ha./year.

1792. TEPPER, H. B., and BAMFORD, G. T. **Hardwoods on poorly drained sites do not respond to low thinning.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 92, 1959. pp. 3. 1 ref.

Low thinnings, removing ca. 30% of the b.a. from 45- and 47-year-old mixed stands (Oak predominating) on moderately productive, poorly drained sites in southern New Jersey, did not increase the 10-year growth (in b.a. or volume) of either the entire stand or of selected crop trees. Where desirable trees were already dominant, it did not improve stand composition.

243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See also Nos. 1404, 1957 *et seq.*, 2611.

1793. KRUEGER, K. W. **Diameter growth of plantation-grown Douglas Fir trees under varying degrees of release.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 168, 1959. pp. 5. 2 refs.

Describes a test, parallel to one in a natural stand [cf. *F.A.* 18 No. 423], in a plantation established at 8 × 8-ft. spacing, aged 27 years from seed at time of release. Treatments tested were removal of 0, 1, 2, or 3 competitors of individual dominant, co-dominant, or intermediate trees. Over a 3-year period, only the dominants showed a progressive increase in diameter growth with increased release, and that not significant at the 5% level. Mean annual growth both of controls and of all treatments in the plantations was 0·2 in. against 0·11 and 0·14 respectively in the older (38 years old) and denser natural stand. Some intermediate and co-dominant trees showed less increment after release [cf. *F.A.* 17 No. 3940].

1794. COOK, D. B. **The hatchet and oilcan technique for the application of sodium arsenite.** *J. For.* 57 (11), 1959 (845–7). 6 refs.

A description of the method, results and advantages of killing unwanted trees by applying Na arsenite from an oil-can into hacks or frills made with the hatchet.

1795. WALTERS, R. S. **Modified girdler shows no advantage.** *Sta. Pap. Cent. St. For. Exp. Sta.* No. 135, 1959. pp. 2.

Tests with a Little Beaver [cf. *F.A.* 17 No. 3945] modified to cut J-shaped rather than C-shaped notches so as to retain the sprayed herbicide, gave neither a higher % of kills, nor a lower % of resprouting and bridged girdles; nor was the herbicide held well in the girdle.

1796. JOHNSON, J. A. **A test of the effectiveness of sodium arsenite impregnated paper strips in killing Aspen and northern hardwoods.** *Tech. Bull. Ford For. Cent., L'Anse* No. 2, 1959. pp. 3 + 2 tbls.

Experiments were made to determine the effectiveness of strips or tabs of paper impregnated with Na arsenite, inserted under the bark, in killing Sugar Maple, Aspen, Basswood, and Elm. Data are given on % crown kill and on time and cost of application. [Cf. *F.A.* 18 No. 2848.]

1797. AREND, J. L. **Airplane application of herbicides for releasing conifers.** *J. For.* 57 (10), 1959 (738 . . . 749). 15 refs.

Reviews some of the American literature. The general prescription for release of conifers is 1–2 lb. acid equivalent of 2, 4, 5-T in 2–5 gal. oil/water carrier per acre. Spraying should be done after the hardwoods are in full leaf, and when the new conifer growth has started to harden off.

245. Tending of Trees, Pruning etc.

See also Nos. 1566, 1835.

1798. KHAN, A. H. **Some observations on debudding and pruning as an aid to get a clean bole in some native hardwoods.** *Biologia, Lahore* 3 (2), 1957 (176–81 + 2 plates). 8 refs. L.S.

Presents recommendations based on preliminary results from trials during 3 years on a limited number of trees of *Morus alba*, *Melia azedarach* and *Diospyros lotus*. No ill effects to the trees were observed, but more extensive trials with a greater variety of species are needed. The time required for disbudding was small and results are promising.

1799. BROWN, A. G., and PAWSEY, C. K. **A study of stub length and occlusion depth following pruning in *Pinus radiata*.** *Aust. For.* 23 (1), 1959 (63–70 + 1 photo). 8 refs.

Two experiments are described in which the three tools commonly used in pruning operations (saw, shears, and axe) were compared. In Exp. 1, the projection of the stubs beyond a datum line was measured in relation to branch diameter, for each tool used, by each of three operators in turn. It was found that appreciable significant differences existed between the resulting linear regression of stub length on branch diameter for the various operator/tool combinations. In Exp. 2, the depth of tissue from stub face to clear wood was measured in relation to stub diameter in stubs pruned by each tool. It was found that only with shears is there a significant regression of occlusion depth on branch diameter. Significant differences existed between the occlusion depths needed for each tool. *Authors' summary.*

26. Combinations of Forestry with Agriculture and Pastoral Husbandry. Irrigated and Floodland Forests, Shelterbelts etc., and their Treatment

1800. Flurholzanbau und Landschaftspflege. **[Tree planting outside the forest and care of the landscape.]** *Allg. Forstzeitschr.* 14 (41), 1959 (705–36). 6 refs. [G.]

A special number, including the following articles: Tree planting outside the forest and wind protection for agriculture (*F. Bauer*) [outlining conditions for government grants in W. Germany]; Choice of species and use of Poplars in plantings to protect and improve the landscape (*K. Buchwald*) [with examples from Bavaria including the afforestation of shale mounds]; Planting Poplars and other species along water-courses (*E. Kirwald*); The suitability of Italian Poplar clones for Germany (*A. Dathe*) [see *F.A.* 21 No. 1672]; an illustrated article on reforestation and rehabilitation of disused gravel pits (*H. Weinzierl*); K fertilizers and rust diseases of Poplar (*H. Schönnamsgruber*) [summarizing Dutch research]; Wind protection in Denmark (*T. v. Mickwitz*); The use of machines for the maintenance and repair of small water-courses (*E. ter Veen*) [including German types pulled by a winch, for use where planted banks rule out other ditching equipment].

263. Irrigated Forests. Forests Subjected to Flooding or Seepage (*Auewald*)

See Nos. 1596–7.

264. Farm Forests

1801. **Tree planting and timber production on the farm.** *Leaflet, Ministry of Agriculture, Government of Northern Ireland, Belfast* No. 62, [*n.d.*]. pp. 10 + 2 tbls.

Briefly covers financial returns, trees as shelter and for ornament, ground preparation including draining and fencing, choice of species, season for planting, spacing, planting methods, manuring and mulching, tending and thinning, and lists schemes of Government assistance for the planting of trees (planting grant, trees for shelterbelts, Poplar schemes, scrub clearance and thinning schemes, etc.).

265. Strips or Lines at Road, Rail and Canal Sides etc.; Hedgerow Trees

See Nos. 1360–1, 1393.

266. Shelterbelts, Windbreaks

See also Nos. 1380–1, 1556, 1652, 1778, 2002.

1802. LINDE, R. J. VAN DER. Het probleem van de houtopstanden in het cultuurlandschap. **[The problem of tree plantings in agricultural areas.]** *Literatuuroverzicht, Centrum voor Landbouwdocumentatie, Wageningen* No. 21, 1958. pp. 44. 151 refs. [Du.du.]

A review of literature, mainly European, N. American and Japanese, with sections on: the influence of shelter on the productivity of neighbouring cultivated areas; the shelter itself (narrow windbreaks, the density of a windbreak, windbreak systems, broader windbreaks and woods, etc.); the influence of shelter on climatological factors (radiation and temperature, humidity, evaporation, precipitation, soil moisture, CO_2 content of the air); the influence of windbreaks in relation to snow and sandstorms; biological aspects; and choice of species. General conclusions are that windbreaks have a positive effect on crop yields in areas with warm dry summers (e.g. S. Europe) and to a less extent in areas of less extreme climate (e.g. Jutland, Schleswig-Holstein, parts of the Netherlands); improved moisture economy in the sheltered areas is probably the main cause of increased yields. Biological disadvantages (competition, spread of pests and diseases) can be reduced by more careful choice of tree species for the windbreaks. Further research is needed in the Netherlands on the effect of windbreaks on crops.

1803. Beschuttingsonderzoek in Zeeland. **[Shelterbelt investigation in Zeeland.]** *Meded. Inst. Toegep. Biol. Onderz. Nat.* No. 44, 1959 (29–32, 37). [Du.e.]

A short account of work already noticed [cf. *F.A.* 19 No. 4215; 21 No. 500].

1804. KREUTZ, W., and WALTER, W. Windschutzwirkung in Abhängigkeit von der Breite und Durchlässigkeit des Hindernisses. **[The influence of width and permeability of obstacles on their effect as windbreaks.]** *Zeitschrift für Acker- und Pflanzenbau, Berlin* 105 (3), 1958 (271–82). [G.] A.P.B.

Describes wind-tunnel experiments on the effect of hedges (represented by models made from moss at a scale of 1: 100) on wind speeds, turbulence and erosion. A single permeable (50% geometrical permeability) row caused less turbulence and erosion danger and had ca. twice the range of effectiveness in wind-speed reduction (14 heights) than a closed (20% permeability) row. Two permeable rows (forming one hedge) were more effective than one, particularly as regards turbulence and wind erosion, but 3 or 4 rows to a hedge increased turbulence considerably and reduced effectiveness in both permeable and close hedges. In practice, a double row of trees or shrubs with a 30–50% permeability is recommended.

1805. NIČOTA, B. Dejstvoto na polezaštitnite šumski pojasi vo namaluvanje brzinata na veterot. **[The effect of shelterbelts on reducing wind speed.]** *Godišn. Šum. Inst., Skopje* 2 (1), 1957 (3–44). 26 refs. [Maced.g.*g*.]

Investigations were made at Ovče Pole, Macedonia, on the effect on wind speed of three shelterbelts: (*a*) 6 m. wide, 4 m. high, 5 rows, orientation N.N.E.–S.S.W., permeable; (*b*) 12 m. wide, 4 m. high, 9 rows, E.N.E.E.–W.S.W.W., permeable; (*c*) 9 m. wide, 3 m. high, 7 rows, N.N.E.–S.S.W., impermeable. Measurements of wind speed in various directions were made, and data on the effect of the belts are tabulated and graphed. Permeable belts were more effective than impermeable. The relative advantages of the three belts, with winds from different directions and of different speeds, are discussed at some length in the German summary.

1806. ANDRIANOV, S. N. Est′ li lesnoj mikroklimat v polezaščitnyh lesnyh polosah. **[Do shelterbelts have a forest microclimate?]** *Lesn. Hoz.* 11 (11), 1958 (77–8). [Russ.]

Details are given of measurements of light, air and soil temperature, soil moisture, wind speed, etc. in (1) a 70-year forest, (2) an 8-year forest, (3) 8-year shelterbelts, 10–20 m. wide, of the following types (*a*) impermeable, (*b*) slightly permeable, (*c*) open-work, and (*d*) highly permeable, and (4) an open field. In all types of (3) the microclimate was intermediate between that of (1) and (2) and that of (4). The microclimate of (3*a*) was nearer to that of (1) and (2), and the microclimate of (3*d*) to that of (4).

1807. Ščepot′ev, F. L. Živye zaščity iz pererosšego posadočnogo materiala na peskah. **[Overgrown planting stock used for living shelter[belts] on sands.]** *Lesn. Hoz.* 11 (7), 1958 (76–7). [Russ.]

In 1934 a shelterbelt of *Maclura pomifera*, *Robinia pseudoacacia*, *Halimodendron* sp., *Gleditsia caspica*, *G. triacanthos*, *Prunus armeniaca*, *P. divaricata* and *Pyrus communis* was planted on the sands of the Lower Dnieper region. Of these, only *P. armeniaca* and *G. triacanthos* were 1-year seedlings, the rest being 2- to 4-year stock cut back to a height of 15–20 cm. to reduce transpiration. The sites had sands of poor structure and low humus content over loess-type loam. A compacted saline horizon 30 cm. thick lay 25 cm. below the sand. *R. pseudoacacia* grew best, followed by *M. pomifera*, *P. armeniaca*, and *G. caspica*. The average heights of the belt at 4, 13, and 20 years were 1·5, 4·2 and 8 m.

1808. Klimov, V. I., and Kuzjurin, A. N. Vyraščivanie polezaščitnyh lesnyh polos v učebnom hozjajstve imeni Kalinina (1949–1957 gg.). **[Growing shelterbelts in the Kalinin Experimental Farm [Tambov region] in 1949–57.]** *Izv. Timirjaz. Sel′.-hoz. Akad., Moskva* No. 4, 1959 (121–38). 3 refs. [Russ.russ.e.] O.W.

Shelterbelts were established mainly by (*a*) nest sowing of Oak with and without inter-row cultivation of agricultural crops, and also by (*b*) row planting and (*c*) row sowing, both with a variety of tree and shrub species. Their growth is analysed, and the good performance of (*a*) attributed to frequent soil cultivation in the first three years. In (*b*), Birch gave the greatest height growth. In (*c*), autumn-sown Ash, *Acer* spp., etc., did satisfactorily if the soil was well prepared.

1809. Trofimova, O. S. Vyraščivanie berezy v lesopolosah pri raznyh sposobah podgotovki počvy pod posadku. **[Raising Birch in shelterbelts with different methods of preparing the soil for planting.]** *Vestn. sel′.-hoz. Nauki, Moskva* 4 (8), 1959 (77–80). [Russ.e.g.f.] O.W.

In the forest-steppe part of W. Siberia, 1-year wildings of *Betula pubescens* were planted 60–75 cm. apart in rows 2 m. apart on leached, medium clay-loam chernozems (one-year fallows): (1) unfertilized, disc-ploughed 35–40 cm. deep; (2) unfertilized, mouldboard-ploughed 20–22 cm. deep; (3) unfertilized, with strips of sunflowers, mouldboard-ploughed 35 cm. deep; (4) fertilized (20 tons manure/ha.), mouldboard-ploughed 20–22 cm. deep. The Birch did best on (3) and (1), while the shallower ploughing, especially (4), proved unsatisfactory.

1810. Goor, A. Y. Informe al Gobierno del Uruguay sobre cortinas protectoras y rompevientos. **[Report to the Government of Uruguay on shelterbelts and windbreaks.]** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1079, 1959. pp. 16 + 2 maps, 5 photos. 7 refs. [Span.] Limited distribution.

268. Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.

See also Nos. 1390, 1582, 1950 *et seq.*, 2592.

1811. Bjerke, S. Om svin og skov. **[Pigs and the forest.]** *Dansk Skovforen. Tidsskr.* 44 (10), 1959 (529–40). [Dan.]

In an experiment in S. Skåne, 15 sows and one boar were allowed free range on 4 ha., enclosed by an electric fence, of 120- to 140-year Beech, with some Oak and Elm. After 7 months, in Dec. 1958, when the pigs were removed, the ground had been thoroughly worked to depths of 20–60 cm. and ground cover of thick grass, raspberries and nettles had been destroyed, at a cost of Kr. 50/ha., the cost of the electric fencing. Old trees of Oak and Elm had been barked to a height of 1–1½ m. and young Elms (15–25 years) had been barked and sometimes uprooted. Mature and young Beech, and well established Beech seedlings were untouched. The feeding habits of the pigs in the field are described. Controlled feeding experiments with bark showed that bark of Oak, Elm and Alder was preferred, followed by that of Ash and Hornbeam, whereas that of Hazel, Birch and Maple was rarely, and that of Beech never, eaten. The pigs were in good condition at the end of the free-range experiment, litters were above average for the district and feeding costs < 30% of normal. In spite of the relatively poor mast year in 1958, there were 20–80 Beech seedlings/sq. m. in autumn 1959 compared with 1 seedling/2 sq. m. before.

1812. Smith, L. F., Campbell, R. S., and Blount, C. L. **Cattle grazing in Longleaf Pine forest of South Mississippi.** *Occ. Pap. Sth. For. Exp. Sta.* No. 162, 1958. pp. 25. 9 refs.

A study of amount and nutritive value of forage under second-growth stands of varying ages and densities. Under the moderate to light grazing of the study, damage to Pine reproduction was light except on local areas of cattle concentration, but planted areas of *Liriodendron tulipifera* needed fencing to prevent serious browsing [cf. *F.A.* 17 No. 4119]. *From authors' summary.*

1813. Hutton, E. M., and Gray, S. G. **Problems in adapting *Leucaena glauca* as a forage for the Australian tropics.** *Emp. J. exp. Agric.* 27 (107), 1959 (187–96). 17 refs. O.R.E.

Discusses variation within and between strains [provenances], seed setting, mimosine content, reproduction, hybridization, adaptation, etc. The vigorous and higher-yielding strains from Peru, El Salvador and Guatemala will be valuable in the breeding of improved types for use in Australia.

1814. Nord, E. C. **Bitterbrush ecology—some recent findings.** *Res. Note Pacif. Sthwest. For. Range Exp. Sta.* No. 148, 1959. pp. 8. 5 refs.

A study, chiefly of *Purshia tridentata* and *P. glandulosa*, distribution in California, soil characteristics, reproduction, hybridization, and ages of stands. [Cf. *F.A.* 8 No. 562.]

1815. Hill, A. G. G. **Grazing control: laws and regulations in various countries for the control of**

grazing to prevent injury to grasslands. *Mimeo. Publ. Bur. Pastures Field Crops, Hurley* No. 2/1959, 1959. pp. 27. 16 refs.

27. Arboreta. Arboriculture for Ornamental Purposes. Hedges and Hedge Plants

See also No. 1653.

1816. Liégeois, P. Arboretum de Stanleyville. **[The Stanleyville arboretum, [Belgian Congo].]** *Bull. agric. Congo belge* 50 (1), 1959 (35–53 + 22 pp. of tbls.). 2 refs. [F.f.du.]

An illustrated description, by families, of some of the plots of 116 native and introduced species. Tabulated details include date of planting or sowing, number and spacing, with ht. and girth increments for 1956. [Cf. *F.A.* 12 No. 22.]

1817. Barrett, W. H. G. Las coníferas del Jardín Botánico de Castelar. **[The conifers of the Castelar Botanic Garden.]** *Idia* No. 141, 1959 (1–8). [Span.] C.G.B.

Brief notes on the garden, which was installed in 1947 in Buenos Aires Province by the Instituto de Botánica Agrícola, with a list of species, their common names and country of origin.

1818. Wyman, D. **Many forms and uses rank Maples high among shade trees.** *Amer. Nurserym.* 110 (7), 1959 (10–1, 88–94).

Lists a large number of recommended species and varieties, with notes on height, hardiness, appearance and horticultural uses, and gives photographs of leaves of 37 species and varieties, laid over a 1-in. grid.

1819. Pirone, P. P. **Why shade trees die along city streets.** *Gdn. J. N. Y. Bot. Gdn.* 9 (6), 1959 (207–10). 4 refs.

An account of the examination since 1956 of 330 dead or dying shade trees in New York City and northern New Jersey, and particularly of the 275 specimens of *Acer platanoides* among them. Of the fungi associated with these dead and dying Maples, *Ganoderma lucidum* [cf. *F.A.* 19 No. 4410], *Verticillium albo-atrum* and *Armillaria mellea* were the most common. Other injurious factors (mechanical injuries, fire, insects, etc.), and the causes of death of several other species of shade tree, are briefly discussed.

28. Husbandry of Forest Products Other than Wood

281. Christmas Trees

1820. Hacskaylo, J., and Goslin, W. E. **Yellow Scotch can be dyed green.** *Trees Mag., Ohio* 19 (6), 1959 (25–6).

Christmas-tree growers have found a means of getting over the trouble of yellowing of Scots Pine in winter, by spraying the trees with latex-based green dyes (Greenzit or Winterlawn). Less spray is needed if spraying is done in the second half of September before the trees have turned yellow.

282. Bark Crops

See also No. 2607.

1821. **Wattle shelterwood experiments.** *Extr.* from *Rep. Wattle Res. Inst. S. Afr. 1958/59*, 1959 (17).

Experiments have shown that the retention of a well-distributed shelterwood of ca. 100 trees/acre, when felling Wattle plantations in areas where frost damage may be expected, will provide sufficient cover to protect the resulting regeneration from serious frosting. If the shelterwood trees can be stripped standing after the first winter, root competition will be obviated.

283. Fruit and Seed Crops etc.

1822. Romero Candau, L. La montanera extremeña. **[Acorns as pig feed in the Oak forests of Estremadura.]** *Montes, Madrid* 15 (88), 1959 (375–83). [Span.]

Of the whole forest area of Badajoz, 94·8% consists of Oak forest, maintained chiefly as a source of fodder for pig raising. Any silvicultural measures are usually directed towards this end. Recommendations are made for pruning, thinning, soil cultivation and weeding. Information is given on the composition of acorns, their use and limitations as feed for pigs, amounts consumed per head and per 100 kg. increase of live weight, with general recommendations as to the organization of pig feeding in the forests.

284. Crops Tapped for Exudations etc.

1823. Mathauda, G. S. **A brief survey of the post-war resin industry in India.** *Indian For.* 85 (8), 1959 (458–67). 11 refs.

After tracing the history and development of resin-tapping industries throughout the world, briefly outlines the position in India, covering: the extent and location of the industry and production by states; its growing significance in India's economy; plans for future expansion; tapping methods, yields, costs, returns, etc. [Cf. *F.A.* 20 No. 533.]

1824. Clements, R. W. **Possibilities of gum production in South Florida.** *Naval Stores Rev.* 69 (6), 1959 (8–9).

Results are presented of resin-yield studies made in stands of *Pinus elliottii* var. *elliottii* and *P. palustris* in S. Florida. Yields from a total of 17 streaks on trees of 10–12 in. d.b.h. in each of the 3 stand types, compared favourably with those recorded from comparable Slash and Longleaf Pine in N. Florida and S. Georgia. The late-season yields were exceptionally good. Monthly yield data indicate that in pure stands of S. Florida Slash Pine it is not profitable to apply streaks before mid-March. For mixed Slash and Longleaf the first streak may be applied some time after March 1st. Transport and labour, however, both present some problems in this region.

1825. Mathauda, G. S. **Preliminary trial on tapping Blue Pine (*Pinus wallichiana* A. B. Jackson) for resin in the Kashmir Valley.** *Indian For.* 85 (10), 1959 (581–4).

Three hundred trees of good form, $>$ 22·5 cm. in diam., were grouped in 2·5-cm. (1-in.) diam. classes, and 4 treatments applied—(*A*) new American face, 25 cm. wide, with the bark freshened and treated with 20% H_2SO_4 at 8-day intervals; (*B*) and (*C*) as (*A*) but with 40 and 60% H_2SO_4 respectively; (*D*) standard Indian type [i.e. French] face, 10 cm. wide and 1·3 cm. (½ in.) deep into the wood, freshened every 4 days, to a height of 5 cm. per month, no acid. Treatments were begun on 10 June and continued till 16 Nov. Results are tabulated and discussed. The difference between resin yields of (*A*)–(*C*) and of (*D*) was highly significant—mean yield per tree (and face) for the whole period 1496 g. and 1163 g. respectively; per unit area of tapped surface, however, the yields from (*A*)–(*C*) were much inferior to that from (*D*). Differences in total yield between (*A*), (*B*), and (*C*) were not significant. The results indicate that resin yields of ca. 2090 kg. and 1600 kg. per 1000 faces could be obtained in a full tapping season by using American and Indian types of face respectively, the former having 3½ times the tapping surface of the latter.

1826. GHOSH, S. S. **Histological responses in the secondary xylem of *Shorea robusta* Gaertn. due to tapping.** *J. sci. industr. Res. India* 17 *C* (6), 1958 (100–3). 12 refs. P.O.

Changes resulting from tapping are described and illustrated with photomicrographs. Full details will be published elsewhere.

1827. HOFMAN, J. Gutonosnost brslenu bradavičnatého na jižním Slovensku. **[Gutta-percha content of *Euonymus verrucosus* in S. Slovakia.]** *Práce Výzkum. Úst. Lesn. ČSR* No. 16, 1959 (103–33). 36 refs. [Cz.russ.e.]

[Cf. *F.A.* 15 No. 2545; 18 No. 4796.] Mean content in the root bark was 8·1%, but no individual shrubs with outstanding yields were found. The best conditions for *E. verrucosus* growth and gutta-percha content were in Oak and Oak/Hornbeam forests.

1828. KINDLEBERGER, B. **Forestry's new "Little Inch" pipeline.** *Amer. Forests* 65 (11), 1959 (32, 62).

Describes a method of tapping Sugar Maple, developed on a Pennsylvania sugar bush, in which the sap is piped to the sugar house. Plastic hoses, inserted directly into the trees, act as feeders to a main trunk line. It is stated that by this method one tapping a year suffices. The chief trouble so far has been roaming deer breaking the pipe-lines. Another trouble discussed is an unidentified fungus causing injuries resembling bark splits and often leading to death.

285. Leaf Crops

1829. HOFMAN, J., and HEGER, B. První hodnocení pokusných plantáží se škumpou ocetnou. **[The first evaluation of the trial plantations of *Rhus typhina*.]** *Práce Výzkum. Úst. Lesn. ČSR* No. 15, 1958 (51–90). 11 refs. [Cz.russ.g.]

Plantations totalling 17·5 ha. (individual areas of 0·25 to 1·5 ha.) were established in 1952–55. Their progress since then, including leaf production and profitability, is discussed, and the tannin content of the leaves determined, its variations according to year, altitude, mean precipitation, bush age, amount of insolation, leaf moisture, and leaf colour, being discussed. Results are tabulated, and it is concluded that *R. typhina* plantations are very profitable in Czechoslovakia. [Cf. *F.A.* 13 No. 4407.]

286. Osier-Growing

1830. GAMBI, G. L'*Amorpha fruticosa*: coltivazione e prodotti. **[*A. fruticosa* : cultivation and products.]** *Monti e Boschi* 10 (10), 1959 (514–21). [It.f.e.]

A. fruticosa is grown extensively in Italy for the provision of rods used to make the basketwork containers for large oil or wine flasks (some 4 million such containers are made annually, half of them of *A. fruticosa* rods). The cultivation, harvesting etc. of the rods are described.

287. Bamboo and Cane Growing etc.

See also No. 1656.

1831. NUMATA, M., and OGAWA, K. **[A field experiment at a stand of *Phyllostachys bambusoides* (1). (Ecological studies of Bamboo forest in Japan, VI).]** *Journal of Arts and Sciences, Chiba University* (*Natural Science Series*), *Chiba* 2 (3), 1959 (284–94). 12 refs. [Jap.e.*e.*] L.S.

Experiments were made from 1955, using different treatments (e.g. cutting all culms older than 2 years in 1955, annual cutting of all culms $>$ 4 years old, treating with N, P, and K alone, or with NPK or NPK + Si). By 1957, statistical analysis showed that best results were obtained from the plots (1) with culms $>$ 2 years old cut in 1955 only, (2) given N fertilizer, (3) given NPK and (4) given NPK + Si. Recovery was very rapid on the plots with treatment (1), the growth of the clumps shading out the weeds below, but the % increase in the standing crop was most noticeable in the three plots where N fertilizers were used. The exceptionally large effect of the N may, however, cause undesirable changes in the mechanical and physical properties of the culms.

288. Crops Grown for Animal Products

1832. TANTAWUTTOE, A. **[Cutting and storing brood lac.]** *Vanasarn* 17 (3), 1959 (55–9). [Siam.e.]

Detailed instructions are given, based on the experience of the Lac Development Unit (Forest Department).

1833. **Improving [lac] crop production on Palas (*Butea monosperma*) by partial artificial defoliation at Kundri Forest of the Bihar Forest Department.** *Extr.* from *Rep. Indian Lac Res. Inst. 1956/57*, 1958 (4–6). I.I.E.

Partial defoliation for the preservation of brood lac in areas where the summers are very hot, appeared to have no ill effects on the long-term lac production of the trees.

1834. **Finding of, and trials as brood preservers of, lac hosts for Baisakhi crop, including certain *Ficus* and *Albizzia* species and also trials of hosts similar**

to those found useful in Thailand. *Extr.* from *Rep. Indian Lac Res. Inst. 1956/57*, 1958 (7–8). I.I.E.

Experiments were made with *Albizzia lucida*, *Ougeinia dalbergioides*, and *Ficus cunia*, all of which provided satisfactory lac hosts.

1835. **Determination of the most suitable pruning methods and seasons for Kusum [*Schleichera oleosa*].** *Extr.* from *Rep. Indian Lac Res. Inst. 1957/58*, 1959 (6–7). I.I.E.

An 8-year study of the best methods, periodicity, and season, for pruning lac host trees so as to produce the maximum number of shoots suitable for infection, has been completed. It is concluded that pruning near the apex of branches at intervals of 1–1½ years, is the best method. Rather more new shoots were produced on trees pruned in June–July than in Jan.–Feb. (the two main seasons of active growth).

289.4. Shade Trees for Crops

1836. KUPPUSWAMI, B. S. **Some observations on the shade experiment at the Coffee Research Sub-Station, Chethalli (Coorg).** *Indian Coffee, Bangalore* 22 (11), 1958 (454–8). 11 refs. E.M.B.

Gives notes on the characteristics of *Albizzia lebbek*, *Artocarpus integrifolia*, *Bischofia javanica*, *Dalbergia latifolia*, *Eugenia jambolana*, *Ficus glomerata*, *F. nervosa*, *F. retusa*, *F. tsiela* and *Pterocarpus marsupium* that are of importance when the species are used to provide shade for coffee. Fifty-four specimens of each species were planted in July 1955, and survival, and mean girth, height, and crown spread in June 1958 are tabulated.

1837. PEREIRA, H. C., *et al.* **Study of shade tree effects in tea plantations.** *Extr.* from *Rep. E. Afr. Agric. For. Res. Organ. 1958*, 1959 (17–8).

Describes an experiment in progress in mature tea under two contrasting systems of pruning *Grevillea robusta*. In another study it was found that tea under large *G. robusta* shade trees had less soil moisture than unshaded tea, but the difference were smaller than those due to the spacing of the tea.

3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD: LOGGING AND TRANSPORT. FOREST ENGINEERING

See also No. 2252.

30. Work Science (Work Studies): General

302. Man and Work (Physiology and Psychology)

1838. SCHILLING, W. Arbeitsphysiologische Beurteilungen der Arbeitsorganisation. **[The physiological aspects of work organization.]** *Forst u. Jagd* 9 (11), 1959 (517–9). [G.]

Discusses investigations into the dangers to health by overstrain through the continuous work of one kind which is so frequently involved in the mechanization and ‘rationalization’ of labour. Felling with a heavy power saw (20 kg.) was found to overtax a man’s strength unless he took turns at lighter work. Stacking was another heavy job necessitating such long rest periods that it would pay to employ two stackers to one cross-cutting saw.

1839. OHSAWA, M., YOSHIDA, T., and NISHIKAZE, O. **[Studies on industrial fatigue with special reference to logger’s fatigue. Application of Human Vitality Criterion (O/K_3) to logger’s fatigue.]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (1), 1959 (9–51). 30 refs. [Jap.*e.e.*]

The study was made on two groups, one using handsaws and the other chain saws, applying [Nishikaze’s?] urine coefficient method. It showed greater fatigue in handsaw workers, not only during and immediately after work, but also on the following morning.

303. Training in Work Science and Efficiency

See Nos. 2603–4.

304. Hygiene. Safety; Accidents and their Prevention

See also Nos. 1838, 1866.

1840. WICKETT, H. **Accidents in the timber industry.** *Aust. Timb. J.* 25 (7), 1959 (27 . . . 37).

Analysis of accidents for 1946–56 showed %’s due to different causes as follows: lifting and moving timber 36·2, saws 11·4, stepping on and striking objects 7·5, hand tools 6·3, loading and unloading trucks 6·0, rolling logs 6·0, felling timber 3·3, hauling timber 1·6. The remaining 29% had no cause ascribed to them.

305. Sequence of Work and Performance (Time and Performance Tables, Evaluation of Work)

1841. HALBERTSMA, S. J. Werkclassificatie in de bosbouw. **[Work classification in forestry.]** *Ned. Bosb. Tijdschr.* 31 (11), 1959 (312–7). [Du.]

Discusses a report prepared by the Raadgevend Bureau Ir. B.W. Berenschot N.V. in consultation with a panel of three forest employers and three employees, for the Netherlands Forestry Commission, classifying different forestry operations into grades according to their value (according to skill, difficulty or danger, responsibility etc.) and thus providing the basis for a wage scale.

307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 1673–4, 1684, 1702, 1739, 1746–7, 1795, 1909, 1946, 2232.

1842. Vystavka izobretenij v sel′skom hozjajstve. **[An exhibition of agricultural [including forestry] inventions.]** *Lesn. Hoz.* 11 (6; 7), 1958 (70–3; 58–61). [Russ.]

Brief, illustrated descriptions are given of the following forestry machines and equipment included in the Inventions Section at the permanent Agricultural Exhibition, Moscow: The JaJu-1 tractor-mounted hole-digger (invented by I. N. Jurov). The SLC-1 landwheel-driven tree-planter (M. I. Čaškin), in which the operators feed the transplants into rubber clamps on the planting wheels. The

SLN-2 tractor-mounted tree planter (M. I. Čaškin and I. G. Kitaev), which consists basically of a furrow-opener and a modified track (from a crawler tractor) with clamps round its edge, transplants being fed by hand to the clamps, while the non-slip track ensures uniform plant spacing. Also described are a horse-drawn seed-drill (V. A. Solov′ev); a circular spade (M. M. Nevzorov) for making planting holes; a device for collecting winged seed from trees (S. Ja. Skvorcov), consisting of a long telescopic shaft, with two electrically-driven, rotating rollers and a brush at the end, with a container for the seed; an apparatus for the extraction and processing of products (vitamin-rich fodder, carotene, chlorophyll etc.) from conifer needles (F. T. Solodkij and A. L. Agranat); a portable cone-drying kiln (S. P. Černaev); an aerosol generator (V. F. Stepanov); an apparatus for making rapid measurements of soil pH under field conditions (G. A. Bondar′); a combined hand-rake and seed-drill (V. A. Solov′ev), in which the seeds are ejected through two special, hollow, curved tines from a container in the handle; and a mattock seed-drill (V. A. Solov′ev) which works on the same principle, seeds being released from a container in the handle, and sliding down over the mattock blade into the ground.

1843. MINDEL′, E. M., and KOTOMINA, G. A. Lesohozjajstvennyj traktor T-47. **[The T-47 forestry tractor.]** *Lesn. Hoz.* 11 (9), 1958 (45–9). [Russ.]

A description and specification of the crawler tractor, designed for silvicultural and general forestry work rather than logging. It develops 40 h.p. at a rated engine speed of 1500 r.p.m., and has a calculated drawbar pull of 3270 kg. in 1st gear. There are two power take-off shafts, front and rear hydraulic lift systems, and 5 forward and 1 reverse gears.

1844. ZOLOTOV, A. N. Malogabaritnyj traktor Pavlovskogo goslesopitomnika. **[A small tractor constructed at the Pavlov State Forest Nursery [Voronezh region].]** *Lesn. Hoz.* 11 (9), 1958 (54–6). [Russ.]

Describes and illustrates a small, tricycle-type tractor designed to draw various nursery implements. Its width is 58 cm., height 90 cm., and length 220 cm. The rate of work in inter-row cultivation and weeding is 2 ha. per 8-hr. shift.

31. Logging and Transport: General

See also Nos. 2247–9.

1845. SINGH, S. N. **The role of improved logging practices in development of forest industries in coniferous forests of Northern Himalayas.** *Indian For.* 85 (8), 1959 (442–5). 1 ref.

The author examines the economics and technical problems of increasing the supply of urgently needed Fir and Spruce from remote Himalayan forests for pulp, paper and rayon manufacture. The traditional floating out of sawn or hewn timber must give way to log extraction by road or cableway, aided by modern equipment (detailed, with photographs) and methods.

1846. VINOGOROV, G. K. Vybor tehnologičeskih shem lesosečnyh rabot. **[Choice in the organization of work in felling areas.]** *Lesn. Prom.* 1959 (10), (8–10). [Russ.russ.]

Discusses the relative advantages of several different organization systems for use in different conditions (e.g. road and skidding-trail lay-out, tractor or winch skidding, hard or soft ground).

1847. LUSSIER, L. J. **Operations research in logging.** *Pulp Paper Mag. Can.* 60 (11), 1959 (146–8, 150).

Discusses, with examples based on five years of practical experience, the kind of logging problems that can be solved by operations research (studies of production and costs).

32. Felling and Related Operations

See also Nos. 1861–74.

322. Felling Season. Preparatory Measures

See also No. 1901.

1848. LOHREY, R. E. **Debarking Bigtooth Aspen with 2,4-D amine salt.** *Tech. Note Lake St. For. Exp. Sta.* No. 550, 1959. pp. 2. P.R.

In spring 1957 tests were begun on *Populus grandidentata* in lower Michigan to compare the bark-loosening effects of (*a*) the butoxy-ethanol ester formulation of 2,4,5-T, (*b*) the alkanolamine salt of 2,4-D, and (*c*) Na arsenite, and to determine the effective period of applications; (*a*) was applied at various concentrations: (i) in a frill girdle; (ii) by direct knapsack spray and (iii) by direct painting on the bark, (*b*) and (*c*) in frills only. Each treatment was applied to 5 trees at roughly weekly intervals from May 22 to Sept. 9. The treatments, evaluated by determining bark looseness on trees felled early in 1958, showed that (*b*), concentrated or only slightly diluted with water, in frill girdles, can be substituted for (*c*) with no appreciable reduction in effectiveness.

1849. FENTON, R. H. **Charcoal from chemi-peeled hardwoods.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 94, 1959. pp. 4. 4 refs.

In this study (at Beltsville, Md.) hardwoods that had been chemically barked and left standing to season yielded 11% more charcoal by weight than equivalent volumes of rough wood. Other advantages include: possible saving in wood handling; less risk of losses by fire, theft and decay; less storage space required at the kiln; by eliminating bark, a general improvement in charcoal quality as well as a higher yield. The advantages of chemical barking and standing seasoning would apply to other forms of round-wood utilization. *From author's summary.*

1850. KROTKEVIČ, P. G. Opyt konservirovanija buka na kornju. **[Experiments in treating standing Beech trees with preservatives.]** *Lesn. Hoz.* 11 (8), 1958 (28–31). [Russ.]

[Cf. *F.A.* 17 No. 2848.] An account of experiments in introducing salts into living, healthy Beech trees in the Ukraine in 1954–55. The best of the methods tried was as follows. A hole was drilled diametrically through the bole, near the base, at an angle to the horizontal, and a series of parallel holes were drilled from each side to meet it. All orifices were sealed with rubber pads, except that at the upper end of the central bore-hole; here a container was fixed, water-soluble salts were packed into the hole and water poured into the container. The arrangement of the holes permitted air to escape. Further doses were given as absorption proceeded. Trees treated in spring and summer 1954 were felled in Nov., stored in a timberyard and examined 11 months later. $Cu(NO_3)_2$ (3 kg./cu. m. wood) was the most successful salt in preventing decay. $CuSO_4$ (3–4 kg.), $ZnCl_2$ (5–6 kg.), $NiSO_4$ (3–4 kg.) and NaOH (5 kg.) were also good. By giving living Beech successive doses of different chemicals (e.g. 3 kg. $Cu(NO_3)_2$ or $CuSO_4$ followed, after washing the holes with hot water, by 2 kg. $(NH_4)_2CO_3$, per cu. m. wood), a colour resembling that of Walnut wood was obtained along with protection against rot. The cost of the method is said to be 30–40% of that of conventional preservative techniques; under the experimental conditions the mean cost was 18 roubles/cu. m. of wood, of which the chemicals cost 11 roubles.

323. Felling and Subsequent Primary Conversion

See also No. 2513.

1851. SCHLOSSER, F. Versuche zur Mechanisierung der Faserholzaufarbeitung. **[Mechanization trials in pulpwood logging and conversion.]** *Allg. Forstzeitschr.* 14 (48), 1959 (833–5). [G.]

In trials in a Bavarian Spruce stand aged ca. 55 years with a mean stem volume of thinnings of 0·15 cu. m., eleven combinations of hand or power saws, trestles and skidding methods (with and without a horse but no tractors) were compared, all barking and trimming being done by hand. The fastest method, using the Stihl thinning tool [cf. *F.A.* 18 No. 4596] for cutting, a horse for skidding whole logs, and a Stihl power-saw with a special Stihl trestle for cross-cutting, saved nearly 25% of time compared with purely manual work, raising output per man-day from 2·32 to 3·04 cu. m., but reduced costs by only 6·8%. All power-saw methods, including the thinning tool, required a second man to throw the stem in the desired direction (wedges were not usable for these small stems) and all methods using special trestles required 2- or even 3-man teams for efficient work, as did the Erve, a French circular saw tested for cross-cutting. This, though on rubber-tyred wheels, was difficult to move over rough or soft ground, and was best suited to large landings.

1852. **[Automation in the Soviet timber industry.]** *Lesn. Prom.* 1959 (11), (1–18). 3 refs. [Russ.]

A collection of articles: Some problems of automation in the forest industry (*G. A. Vil'ke*) [a theoretical discussion]; The industrial log depot—an automated concern (*K. I. Voronicyn* and *D. K. Voevoda*) [with plans of the automated flow of work possible with different basic sets of sawing and sorting machinery]; Improve the technology of industrial log depots to meet the requirements of automation (*Ja. I. Čikov*); Automation of primary conversion (*G. G. Hrustalev et al.*) [barking, breakdown, sorting and packaging of posts and pitprops, and sawing sleepers]; Automation and packaging of small-size assortments (*I. V. Vatin*); Automation in breaking-down tree-length logs in Semigorod lespromkhoz (*V. S. Ganža* and *A. P. Los'*).

1853. WEISSGERBER, H. Arbeitsverfahren und Schlagordnung im Nadelholz-Kahlschlag. **[Method of work and order of cutting in clear-felling conifers.]** *Forst- u. Holzw.* 14 (19), 1959 (417–8). [G.]

Describes and illustrates the method in detail. Some large trees are first felled at right angles to the general felling direction, so as to form lines 6–7 m. apart, right across the felling area. The other trees are then felled in the planned direction, so that each of them lies on 3–4 supports. Some of the advantages claimed for the method are; more rapid trimming, barking and drying; ease of handling, measurement and extraction; reduced danger of decay.

327. Inventory and Control of Fellings

See also No. 1856.

1854. JAHN, E., and SINREICH, A. Hinweise zur Erkennung des Schlagalters von Fichtenstöcken an Befallsfolgen durch Insekten und Pilze und den allgemeinen Zustand in verschiedenen Altersstufen. **[Indications for inferring the time since felling from the sequence of insect and fungus attack on Spruce stumps and their general condition.]** *Allg. Forstztg.* 70 (19/20), 1959: *Suppl.* (*Informationsdienst* No. 25). pp. 1–2. 1 ref. [G.]

Reports on studies in 1958 on stumps cut between 1943 and 1956 on a N.E. slope in N. Tyrol, mostly at 1000 m. alt. The stages of decay of the cambial layer and the wood, and the insects associated with each stage [cf. *F.A.* 17 No. 2590] are described. Conditions were similar on a 5-year-old felling site in Lower Austria at a similar altitude, but decay was slower at higher altitudes on the Tyrolean slope. With knowledge of local climate etc., approximate determination of felling dates by these methods is considered possible. [Cf. *F.A.* 20 No. 3407.]

33. Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood. Salvage Fellings

See also Nos. 1951 *et seq.*, 2096, 2431.

1855. BENIĆ, R. Prirodni gubitak (kalo) u iskorištavanju šuma. **[Natural volume loss in logging.]** Stručno udruženje šumsko-privrednih organizacija Hrvatske, Zagreb. 1957. pp. 19. 4 refs. [Croat.]

A manual for loggers in Jugoslavia. Tables and graphs are given of the natural volume losses of various assortments of different species due to shrinkage during storage in the forest or timberyard, and to bark losses. Volume losses are also given for various methods of skidding and transport.

1856. MAY, R. H., and HARTONG, A. L. **A survey of logging residue in California by the "two stage" method.** *J. For.* 57 (10), 1959 (724–8).

This method of measurement requires: (1) the establishment of sample plots where timber has been felled and cross-cut but not yarded, with measurement of the volume of felled trees and the extent of felling damage in the reserve stand; (2) after yarding, measurement of the material left and any additional damage to the reserve stand from yarding. A survey using this method in California in 1953 on 28 plots is described and the results evaluated. The method proved satisfactory in the Pine region, and should be usable in any region where the areas being logged are not steep, and where the timber is relatively free from defect. In the Redwood region, the method was not a success, because of the size of the trees, steep slopes and the highly defective timber.

1857. CAROW, J. **Yarding and loading costs for salvaging in old-growth Douglas-Fir with a mobile high-lead yarder**. *Res. Pap. Pacif. Nthwest. For. Range Exp. Sta.* No. 32, 1959. pp. 26. 3 refs.

[Cf. *F.A.* 19 No. 1823.] A supplementary time and production study analysing the effect on cost per 1000 bd. ft. of various factors, chiefly haul-in distance, log size, and available volume per acre.

1858. CARPENTER, B. E. **Bolts salvaged from cull Oaks?** *Sth. Lumberm.* 199 (2484), 1959 (30–1).

Describes re-logging trials, started primarily to reduce the cost of killing cull trees, in which 42-in. bolts of high quality are harvested, in logged, mixed forests near Warren, Ark. A tally in three such areas showed an average of 765 bd. ft./acre of clear bolts from 4 to 8 ft. in length, mostly Red or White Oak, and a further 405 bd. ft./acre of sleepers.

1859. HOBBIS, E. W., and COLES, J. S. **The destruction of Apple tree stumps and roots by chemical means.** *Rep. Agric. Hort. Res. Sta. Univ. Bristol 1958*, 1959 (59–61). 2 refs.

A small-scale trial is described in which the disintegration of Apple tree stumps and roots by aqua regia, NaOH, $CaOCl_2$ and a N/P fertilizer was investigated. Four years after treatment, the fertilizer was the only material that had induced softening of the wood. NaOH was the least effective of the materials tried. *From authors' summary.*

1860. ALLISON, H. W. S., and CUNNINGHAM, R. K. **Preparing land for Cacao in Ghana. Land clearance for field experimentation.** *World Crops* 11 (9), 1959 (311–3). 1 ref. O.R.E.

Discusses the methods, the amount of work, and the costs, of clearing 35 acres of jungle. The air-dry weight of timber removed was 183 tons/acre, and the total establishment costs (including planting cacao, fertilizing, etc.) were £98. 1s. 3d./acre.

34. Storage of Wood in the Forest and at Log Dumps ('Landings')

See Nos. 1852, 2484–6, 2490, 2513.

35. Performance Measurements for Determining Piece Rates in Felling and Related Operations

1861. PUTKISTO, K. Työpanoksen ero pinotavaran palstatienvarteen teon ja hajamuodostelmiin teon välillä ja sen huomioon ottaminen palkkaperusteissa. **[The difference in expenditure of time between making cordwood alongside the strip road or at scattered points and the observance of this difference in establishing bases for wages.]** *Tied., Metsäteho, Helsinki* No. 164, 1959. pp. 26. [Fi.*e.e.*]

Presents graphs and tables showing, as between the two methods, conditions in which the time taken is the same, and differences in time for different assortments, classes of difficulty, stand density and amount of timber collected (1–4 cu. m.) at each point. Moving the bolts to the conversion site took rather longer (differences of 1·18–2·52 man-min./stacked cu. m.) for cordwood stacked at the roadside (assuming a strip-road spacing of 30 m.), and this method also called for clearing the strip road (0·63–5·12 man-min./stacked cu. m. for a strip road 350 linear m./ha. in length). The total mean difference in work between the methods ranged (with stand density) from 1·81 to 5·31 man-min./stacked cu. m. and the difference in cost from Finmarks 4·60 to 13·60/stacked cu. m., in favour of dispersed points.

1862. MAKKONEN, O. Paperipuiden teko moottorisahaa käyttäen: vertaileva työntutkimus. **[Preparation of pulpwood with power saws: comparative work study.]** *Tied., Metsäteho, Helsinki* No. 163, 1959. pp. 14. [Fi.*e.e.*]

Tables are given showing the different times taken for the various phases of work in preparing unbarked Spruce pulpwood by hand or using various power saws. The saving in time per unit prepared, when using a power saw, was 13 to 25%, for stands with a mean stem size giving 6 stems per stacked cu. m. Considerable time was saved by skilful operators in converting and handling even the smallest stems, but with inexperienced operators there was little difference in time between sawing small material by hand or by power saw. With experienced operators, time saved is not much affected by stand volume. Changes in the distribution of working time (the proportion of time spent on felling and cutting into lengths being reduced, and that spent on trimming increased) are not considered adequate to justify changes in work-difficulty factors in existing wage tables. The increase in the proportion of time spent on barking, where this is done by hand in the forest, should lead to increasing differences between unit wages for preparing barked and unbarked wood. The recent doubling of earnings by workers preparing cordwood is attributed as much to longer hours worked as to time saved by using power saws.

1863. TUOVINEN, A. Aikatutkimus halkoaumojen teosta. **[Time study on the making of firewood stacks.]** *Tied., Metsäteho, Helsinki* No. 166, 1959. pp. 10. [Fi.e.]

Presents results of a study on time expended in preparing different types of stack (illustrated).

36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 1799, 1851–2.

1864. HENSEL, J. S., and ALTMAN, J. A. **Cases in point for the Morbarker portable debarker.** *Paper Tr. J.* 143 (37), 1959 (56–8). P.O.

The barker (illustrated) uses two barking heads, armed with four spiral rows of carbide-tipped cutters. All species and conditions of wood (i.e.

hard, soft, green, dry or frozen), from 2½ to 16 in. in diam., and 4–20 ft. long can be barked. The barker is 8 ft. long by 6 ft. by 6 ft. and weighs, including the tyres and a trailer hitch for use in towing, 2500 lb. A crew of two is needed. Barking tests were made on 52-in. thinnings of different diameters, of typical northern hardwoods, including Ash, Hard and Soft Maple, Beech, Birch and Cherry; and on 8-ft. rough Aspen. Results are tabulated. Good results were obtained in summer and winter with all species and irrespective of the seasoning of the wood. Production varied from 2½ to 3 peeled cords/hour, generally increasing with stick dimension; difficulty was, however, found at diams. > 13 in.

1865. Jehle, R. Entrindungsmaschinen. **[Barking machines.]** *Forstarchiv* 30 (11), 1959 (227–8). 2 refs. [G.]

Describes the Mira, Sund, Cambio and Bark-Lasse machines [cf. *F.A.* 19 No. 479], two German power-assisted hand tools, the 'Römer', weighing ca. 12 kg. and operating with a flexible knife [cf. *F.A.* 20 No. 4641] and Bezner's tractor-drawn 'Waldschäler', operating with a rotating cutterhead. This last type is claimed to be the only one that barks 'clean'.

1866. Motorsägeneinsatz. **[The use of [one-man] power saws.]** *Allg. Forstzeitschr.* 14 (44), 1959 (765–80). [G.]

A special number, with articles on: The use of [saws and other] machines in logging (*Schüssler*) [with some data on output and earnings with power saws in Hesse]; Training in the use of one-man power saws (*H. B. Platzer*) [discussing special courses and general training courses]; Maintenance of planer sawteeth in power saws (*W. Weismann*) [a practical instruction leaflet]; Accidents with power saws (*H. Müller* and *P. Houtermans*) [a practical leaflet on prevention, first aid etc.].

1867. Schulze, H. Neue sowjetische Einmann-Motorsägen. **[New Russian one-man power saws.]** *Forst u. Jagd* 9 (10), 1959 (474–5). [G.]

Briefly describes, with main specifications, the one-cylinder Kama I and the two-cylinder Kama II, exhibited in Moscow. Both, and particularly the Kama II, are claimed to give higher performance with lower fuel consumption than the 'Družba' [cf. *F.A.* 16 No. 4139] and to have greatly reduced vibration. They do, however, require high-octane fuel.

1868. Laubgan, A. A. Peredvižnaja motorizovannaja pila PMP-1 dlja mehanizacii rabot po uhodu za lesom. **[The PMP-1, a power saw on wheels for mechanized tending operations.]** *Lesn. Hoz.* 11 (11), 1958 (56–9). [Russ.]

The unit, designed by VNIILM, has a horizontal circular saw blade driven at 1700 r.p.m. some 50 mm. above ground level. The blade and engine are mounted on a frame between two bicycle wheels, the operator steering the whole unit by a pair of handles. Bushes and trees up to a max. diam. of 20 cm. can be cut. The results of practical trials, which are discussed, are promising.

1869. Šemčuk, Ju. S. Prisposoblenie dlja zatočki pil′nyh cepej. **[A device for sharpening chain saws.]** *Lesn. Prom.* 1959 (9), (15–6). [Russ.]

Describes, with engineering drawings, a device which, designed for use with the Družba power saw, utilizes the engine of the saw itself in sharpening.

1870. Kačelkin, L. I., and Rušnov, N. P. Novaja ustanovka dlja polučenija tehnologičeskoj ščepy. **[A new chipper.]** *Lesn. Prom.* 1959 (10), (3–7). [Russ.]

Gives full specifications of the CNIIMĖ-DM 1 chipper, 6-bladed, with drum speed 600 rev./min. It is intended for chipping branches and tops up to 120 mm. in diameter. At max. loading, the machine can deal with 12·2 cu. m. of material/hour, and at normal running 8–10 cu. m. After some modifications (e.g. reducing the number of blades to 4), the machine will be manufactured as the CNIIMĖ-DM 2.

1871. Heiskanen, V. Polttohakkeen hankinnasta. **[Procurement of fuelwood chips.]** *Metsät. Aikak.* 1959 (9), (309 . . . 317). [Fi.e.]

Describes 6 Finnish chippers, showing price, weight, power consumption, maximum wood diameter, size distribution of chips obtained etc., and presents results of preliminary time studies, and data on working life, mobility and other operating characteristics. Roundwood used for chipping has a diameter range of 3–15 cm., and trees are cut into 4-m. lengths. Seasoning with crowns intact is desirable. Cost per cu. m. of chips was reduced when untrimmed wood was used, but chip quality and volume of wood per cu. m. of chips were also reduced. The main factors affecting machine output are size of gang, wood diameter, wood condition as regards seasoning and freezing, lay-out of the working site, and organization of the work.

1872. Heiskanen, V. Kenttähakkurit polttohakkeen hankinnassa. **[Portable chippers for producing fuelwood chips.]** *Teho, Helsinki* 1959 (7/8), (361–8, 385, 404). [Fi.sw.e.]

Presents data on output, capacity, time, etc. of various Finnish chippers (illustrated) and discusses the effect of idle machine time on performance. *From author's summary.*

1873. Baak, W. Reisshaken zum Zeichnen stehender Bäume. **[Tree scribes.]** *Forstarchiv* 30 (10), 1959 (204). [G.]

Discusses and illustrates 4 types recently tested in Germany.

1874. Lysikov, D. I. Stanok dlja pressovanija hvorosta. **[A machine for compressing brushwood.]** *Lesn. Hoz.* 11 (9), 1958 (49–51). [Russ.]

The machine consists of a solid frame with a fixed C-shaped form and a movable form of identical configuration, between which the brushwood is pressed into a bundle. Power is provided either by hand via a lever mechanism, or by a 0·25–0·5 KW motor. Branches and brushwood from 25 to 100 cm. long can be pressed into bundles or fascines for easier transport. Minimum bundle diam. is 30 cm.

37. Transport

See also Nos. 1845–7, 2247–9.

371. Loading and Unloading

1875. Lepitre, C. Le choix d'un engin de chargement. Quel procédé adopter? **[The selection of loading equipment. Which method should be used?]** *Bois For. Trop.* No. 67, 1959 (43–56). [F.e.span.]

Examines a number of methods currently used in Africa, their respective labour requirements, and the influence of log dimensions on the choice of any one of them. The methods of loading discussed are: bulldozer and ramp; tractor-mounted winch; mechanical log loaders; sheerlegs; mobile cranes; and winch and skyline.

1876. Hakkarainen, A. E. Vanerikoivujen autoon kuormaus ja autosta rautatievaunuun purkaminen. **[Loading veneer Birch logs on to lorries and transferring loads from lorries to railway wagons.]** *Tied., Metsäteho, Helsinki* No. 167, 1959. pp. 22. [Fi.e.]

In studies in May and June 1959, 29 loads were loaded into lorries and 20 loads transferred from lorries to railway wagons by 4 gangs of 2 men each, using the mechanical-boom lifts accessory to the lorries. The mean productive working time in loading was 43, and in transferring the loads 37 min./load. The distribution of these times between various operations (e.g. preparing the lorry or railway wagon, moving and releasing the tongs) is shown. The proportion of interruptions in the productive working time was 5·8% in loading, chiefly spent in maintenance and repair to the loading device, and 14% in transferring the loads, chiefly in waiting for the railway wagons. *From author's summary.*

372/377. Land Transport

See also Nos. 1857, 1904.

1877. Kojima, K. **[On the tractive resistance coefficient of Ezo Spruce and Japanese Oak logs in ground skidding and arch logging.]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (1), 1959 (345–59). 5 refs. [Jap.e.]

A study was made of 11 logs (6–12 ft. long and 12–18 in. diam. at small end) of *Picea jezoensis*, and 8 of *Quercus* spp. (8–12 ft. long and 12–18 in. diam.) on moderately wet, volcanic soil. Results are tabulated in the English summary.

1878. Logan, B. A. **Bunching studies and application of results.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1860 (*B*-8-*a*), 1959. pp. 2 + 4.

A report, discussing the requirements of pulpwood bunching equipment, including allowable costs, under conditions in E. Canada.

1879. Lloyd, A. H. L'utilisation des câbles aériens pour le débardage des bois en zone tropicale. **[The use of aerial cableways for timber extraction in the tropics.]** *Bois For. Trop.* No. 68, 1959 (21–9). [F.e.span.]

Discusses recent developments of new types of cableway suitable for operation in tropical countries. Many kinds of cableway are used in Europe, but most of them are unsuitable for tropical conditions, and the only types that have been successful in recent years are the 'Skyline Cranes'. These and their methods of operation are described in detail. Their adaptability to tropical forest conditions is considered, and examples are given with illustrations of recent Skyline operation in Nyasaland, and also in India and Pakistan. Until 1956, the maximum cableway load of 3 tons limited the size and weight of the logs that could be extracted, but the new Skyline Cranes can now carry loads up to 5 tons, which may extend their use to heavy tropical hardwoods in mountain forests where other methods of extraction are commercially unprofitable. The economics of Skyline cableways used for timber extraction in different parts of the world are briefly discussed. *From author's summary.*

1880. Naruse, Y. **[An example of simplified log hauling cableway.]** *Misc. Inform. Tokyo Univ. For.* No. 12, 1957 (199–204 + 10 photos). [Jap.]

Illustrated description of a small gravity cableway ca. 360 m. long, with one intermediate bend and a total drop of 39 m., which delivered 36 koku (nearly 360 cu. ft.) of conifer logs per 8-hr. day.

1881. Yamawaki, S., *et al.* **On the hauling of wood by two-endless cable crane.** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 108, 1958 (47–65 + 4 plates). [E.e.jap.]

The authors have made a pilot model of a two-drum, endless-cable type of skidder with a special carriage, and have tested it in the field. Its distinctive feature is that the carriage has a special mechanism (illustrated by scale drawings and photographs) which eliminates the need for falling block or counterweight. In field tests it was found possible to skid ca. 100 koku [982 cu. ft.] of 7-ft. pulpwood in a net working time of 5 hr. 40 min. The tension on the two endless operating lines in the field test was somewhat greater than that in ordinary systems, and the cables would probably wear out sooner. In general, it is believed that the system is simpler and cheaper to operate than those currently used, and it could also be applied to aerial hauling of timber over a single span of 600 m.

1882. Sugden, M. J. **Buoyed cable logging—a universal method for harvesting wood.** *Pulp Paper Mag. Can.* 60 (9), 1959 (186 . . . 192). 3 refs.

Propounds the thesis that the ultimate in highlead logging is logically a large balloon (452 ft. long, ≯ 86 ft. diam., to support a 75-ton load) anchored 750 ft. above ground by 12 cables each 3400 ft. long. These, radiating from 12 electric winches set on a platform slung under the balloon, allow loads to be hauled up one side and paid down on the other. The idea, which includes an auxiliary loading balloon, is worked out in great detail.

1883. Turk, Z. Sankalne plošče za izvlačenje lesa. **[Skidding pans for timber extraction.]** *Gozd. Vestn.* 17 (7/8), 1959 (203–15). 5 refs. [Sloven.]

Details, with engineering drawings, the design of metal skidding pans drawn by horses. Data are given on skidding resistance, and on the savings possible by the use of these pans. Their optimum width is 65–80 cm. for one horse, and 80–100 cm. for a pair.

1884. GRUGEON, C. H. **Snigging studies.** *Aust. Timb. J.* 25 (7), 1959 (84 . . . 95).

Work studies were made on some 600 miles of tractor travel in order to evolve a reasonably reliable system of estimating daily volumes skidded in any given logging area where tractor extraction is employed. It is concluded that the three most important factors involved are log size, gradient, and distance, and it is suggested that a fairly accurate result can be obtained by adopting a representative average log volume for the whole area, an average distance from stump to landing, and some form of gradient rating for the area. The practical application of these factors is discussed.

1885. BENZIE, J. W. **Small tractors, ground skidding reduce tree damage in selection harvest.** *Timberman* 60 (11), 1959 (42–3, 54). 4 refs.

Investigations on three areas of old-growth northern hardwoods where the b.a. was reduced from 132 to 70 sq. ft./acre by removing trees ⩾ 10 in. in d.b.h., showed that (*a*) tree-length skidding with a Caterpillar D6 tractor plus logging arch injured three times as many of the residual trees as (*b*) ground skidding 8- to 16-ft. logs with a D4 tractor. Tree-length skidding with the D4 and modified equipment injured only half as many trees as (*a*). Although (*b*) injured the fewest trees, it caused the highest proportion of root injury. Stem injuries caused by (*b*) were smaller and lower than those caused by (*a*).

1886. IVANOV, I. Traktory S-80 i S-100 na prjamoj vyvozke drevesiny. **[Direct extraction of wood by S-80 and S-100 [crawler] tractors.]** *Lesn. Prom.* 1959 (9), (14). [Russ.]

An analysis of the work of five S-80 tractors and one S-100, in direct extraction of timber for distances of 3–5 km. (loads were 25–30 cu. m./tractor/trip) to a river for loose floating. Total daily output was 500–700 cu. m. The analysis includes planned and actual output per tractor-shift, earnings, etc., and confirms the desirability of the method of direct extraction.

1887. EHMKE, K. Triebachsanhänger in der Forstwirtschaft. **[Power-driven trailers in forestry.]** *Allg. Forstzeitschr.* 14 (48), 1959 (844–6). [G.]

Discusses advantages and drawbacks, including desirable improvements in construction and the need for great care to prevent accidents due to braking difficulties.

1888. ZAV'JALOV, L. A., and SEROV, A. V. Toplivozapravočnaja i podogrevatel'naja ustanovka dlja lesozagotovitel'nyh predprijatij. **[The [TPU-2] fuel replenishing and heating unit for logging undertakings.]** *Lesn. Prom.* 1959 (9), (16–8). [Russ.]

An account of tests of the prototype unit during winter 1958–59 at the woods workshop of the Kirles combine. The TPU-2 (design given) is an insulated, covered trailer for supplying skidding tractors with diesel fuel, oil and hot water, especially during operations in very cold weather. It contains a 1400-litre diesel-fuel tank, two 100-litre oil tanks, a steam-boiler, pump etc. The unit worked satisfactorily, and the hourly output of the tractor gangs using it rose by 25%. Some improvements and modifications are suggested, before mass production commences.

1889. KEYS, G. T. **Trip stake designs used in Eastern Canada. A compilation of designs.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1886 (*B*-10), 1959. pp. 3 + [12].

Describes tripping principles on lorries etc., and gives sufficient information on the various designs (with illustrations) to allow intelligent selection to be made.

1890. OGUMA, Y. **[On the diesel locomotives of forest railways in Hokkaido.]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (1), 1959 (361–92). [Jap.e.]

Describes the history of the introduction and use of diesels (totalling 161 by the end of 1958), and the specifications of the various types now current.

1891. HAFNER, F. Möglichkeiten forstlicher Transporte mit Hubschraubern. **[The prospects of helicopter transport in forestry.]** *Holz-Zbl.* 85 (135), 1959 (1811–2). 21 refs. [G.]

A review based chiefly on American and French literature.

1892. SHAW, R. G. **Timber extraction by helicopter. Interim report on work done in Great Britain.** *Scot. For.* 13 (3/4), 1959 (141, 143 + 1 photo).

Reviews results of trials in 1956 [cf. *F.A.* 20 No. 4683]. Developments in helicopter design since then justify hopes of the helicopter's becoming competitive in timber extraction.

1893. HARTGERINK, N. **Sky-hook logging.** *Pulp Paper Mag. Can.* 60 (9), 1959 (176 . . . 184). 3 refs.

Tests with a Sikorski S-55 helicopter (rated payload 1500 lb.) were made (one day only) in transporting stacked pulpwood from a 300 × 500-ft. clearing to a lake ca. 1 mile away and 800 ft. lower in altitude. The loads were hooked on as the aircraft hovered over the stack. Points emerging were: (1) the apparent necessity for nearly perfect weather conditions; (2) the low lifting capacity (ca. 1000 lb.); (3) a best round-trip time of ca. 4·5 min. It is considered that some hitherto inaccessible wood would become available by using helicopters, but clear felling is necessary with this method of extraction, and this is frequently undesirable from the silvicultural and management stand-points. Cost analysis of this operation, and other estimates for new helicopters still untested, indicate that transport of pulpwood by helicopter will remain uneconomic in the foreseeable future.

378. Water Transport

1894. Virkestransport inom vattenkraftpåverkade flottledsområden. **[Timber transport in floating networks affected by water-power requirements.]** *Årsb. Svenska Flottledsförb.* No. 33, 1959 (5731–79). [Sw.e.]

Comprises three papers (by *A. Kamp*, *E. Bager*, and *I. Rönnberg*, representing the floating agencies, forestry, and the power producer) with discussion. The main disadvantages to floating of regulation on behalf of hydro-electric stations are that (1) the higher rates of flow maintained during the winter mean that the beaches formerly used for winter stacking of timber are under water and that the ice is weakened, so that timber must be stacked on land and labour detailed for its launching in spring; (2) reduced speed of flow in summer and in the neighbourhood of dams reduces transport capacity and makes sorting more difficult. Some methods of reducing these disadvantages are discussed.

1895. FORSSELL, G. Synpunkter på flottningskalkyler. **[Aspects of floating calculations.]** *Norrlands SkogsvFörb. Tidskr.* 1959 (3), (283–51). 18 refs. [Sw.sw.]

[Cf. *F.A.* 20 No. 3257.] Presents sample calculations for determining: the "S-limit" (the area in a floating system in which floating is the most economical form of transport); and the effect on costs of varying the amount of material floated, transporting the timber for some distance by road, transport agreements between different concerns, etc.

1896. AGER, B. H. Preparering av is för virkesavläggning. **[Preparing ice for timber storage.]** *Skogen* 46 (21), 1959 (432–5). 3 refs. [Sw.]

[Cf. *F.A.* 20 No. 3259.] Presents figures showing the effect on rate of freezing and on depth of snow-ice and black ice of watering or compacting the surface snow, or both in combination, or of clearing the snow from the surface of the ice, and discusses the merits of the various methods when fresh snowfalls are likely. Describes the equipment and techniques used for watering and compacting, with graphs showing the time expended on watering for different snow depths and for pumps of different capacities, and on compacting for different snow depths and types of equipment (compactors drawn by horse, tractor or jeep, crawler tractor, etc.).

1897. SÖDERLUND, J. Uppvattning för isförstärkning. **[Pumping up water for ice strengthening.]** *Skogen* 46 (20), 1959 (414–5, 417). [Sw.]

Describes various types of screw or propeller pump used to pump water from under the ice, and presents graphs comparing their pumping capacities, and diagrams showing the distribution of the water on the surface after pumping for 1–6 min.

1898. ERYKALOV, V., and KAPUSTIN, V. Mehanizacija sbroski breven v vodu. **[Mechanized log-launching.]** *Lesn. Prom.* 1959 (11), (23–4). [Russ.]

Describes a launching grab developed at Sverdlovsk. The logs to be launched must be stacked on skids leaving ca. 30 cm. of clear space between the stack and the ground. The grab consists basically of two curved hinged jaws mounted on a framework. It is winched (with jaws open) up to the stack, takes on its 'bite' of logs, and is then pulled back down the bank and into the water, where the logs are released. The working cycle takes 2·2–8 min. (average 4 min.) for a haul of 30 m. Mean load per trip is 3·7 cu. m. with 50 cu. m. launched per hour, using a 2-man team.

1899. CHÊNG, H.-L. Vlijanie napravlenija voln na volnoustojčivost′ pučkov. **[The influence of wave direction on the wave resistance of bundles.]** *Lesn. Prom.* 1959 (9), (23–4). [Russ.]

In order to confirm observations made on the Rybin reservoir in a storm of force 8, that waves striking a raft obliquely were the most destructive, tank tests were undertaken to discover the influence of waves striking stationary model bundles (*a*) head-on, (*b*) obliquely, and (*c*) at right-angles to the bundle's longitudinal axis. Waves (*a*) were the most dangerous, breaking up the bundle in a period 60% of that for (*b*) and only 10% of that of (*c*). The reasons for the rapid breaking up of bundles exposed to (*a*), i.e. while pitching, are discussed. In further tank tests made with model raft sections (42 bundles) towed at 0·18 m./sec., waves (*b*) were found to be more dangerous than (*a*). The reasons for this, too, are discussed, and are found to be not incompatible with the different result for single stationary bundles. It is concluded that, in towing rafts, manoeuvres should be made to avoid waves (*b*).

1900. SOLODUHIN, M. Uskorit′ dviženie plotov po vodohraniliščam. **[Speeding up the movement of rafts on reservoirs.]** *Lesn. Prom.* 1959 (10), (20–2). [Russ.]

Three possibilities exist: (1) reducing raft size; (2) streamlining the raft; (3) fitting a wave-reducer in front of the raft. As (1) was not usually desirable, efforts were concentrated on (2) and (3). Model and full-scale tests showed that making rafts with a triangular section fore and aft, i.e. (2), gave some increase in raft speed, but such rafts could be used only in calm weather, as the front of the raft soon broke up in waves. Head-on wave pressure P (in kg.) was found to be $7{\cdot}25\, B\, T\, \lambda^{0{\cdot}5}\, H^2\, (1 + 1{\cdot}15\, v)$ where B is raft width, T raft draught, λ is wave length, h is wave height, and v is towing speed per sec., all measurements being in m. Model tests with a wave-reducer consisting of bundles of tree-length logs arranged as a hollow triangle in front of the raft showed that the resistance to movement in waves was reduced by 10–17%, which corresponds to an increase in raft speed of 5–8%. In full-scale tests on the Kuibyshev reservoir in 1958, more than 20 rafts fitted with wave-reducers were dispatched, giving considerable savings in towing time and expense.

1901. PRAVDIN, L. F., *et al.* K voprosu o splave listvenničnoj drevesiny. **[Floating Larch wood.]** *Trud. Inst. Les.* No. 45, 1958 (145–65). 11 refs. [Russ.]

Describes various methods of girdling Larch [*Larix gmelinii*] to reduce its moisture content before felling and floating. Tabulated data are given on the changes in the m.c. and density during drying-out, for (*a*) standing girdled trees, and (*b*) stacked logs, either roughly barked or unbarked. The variations in density and m.c. of logs from different parts of the stem are also examined. Though both methods reduce m.c. and density considerably, prolonging the period for which the logs can float, neither method completely eliminates floating losses. Floating techniques should be improved for Larch, and logs should not be in the water for > 30–45 days.

1902. MODIN, S. Provanläggning för mekanisk sortering vid Sandslåns skiljeställe. **[A pilot plant**

for mechanical sorting at the Sandslån sorting point [Ångermanälv].] *Årsb. Svenska Flottledsförb.* No. 33, 1959 (5780–6). [Sw.e.]

Describes, with illustrations, methods and equipment used for sorting timber floated jointly. Trials began in 1958 and were to continue through 1959.

1903. Hammer, T. R. **Development of airdrive boat.** *Pulp Paper Mag. Can.* 60 (10), 1959 (258, 263).

Describes an air-drive boat (marine engine and air propeller) for travel in inaccessible forests where river depth in summer is usually not sufficient for normal boats. The prototype 18-ft. boat can take a payload of ca. 1200 lb. on 2 in. of water at ca. 25 m.p.h.

38. Forest Engineering

383. Roads and Bridges

See also Nos. 2247–9.

1904. Szepesi, L. A kiszállítás vonóeröszükséglete földutakon fagyott és felázott viszonyok között. **[The tractive force required in transporting timber on frozen and saturated [forest] earth roads.]** *Erdö* 8 (5), 1959 (165–9). [Hu.russ.g.]

Outlines the advantages of timber haulage on frozen roads (use of high-speed, 4-wheel-drive lorries with differential lock, multi-stepped gears, pneumatic brakes) vs. haulage on saturated roads where the traction requirement/load is 2–5 times greater (tabulated data given, based on dynamometer readings).

1905. Lasica, M. D. Koleerez-snegoočistitel′. **[A track-cutting snow-clearer.]** *Lesn. Prom.* 1959 (9), (19–21). [Russ.]

A description, with illustrations, of bulldozer-mounted equipment of Russian manufacture used for making and maintaining roads for timber transport.

1906. Grehov, G. F., and Kozlov, A. I. Lesovoznye avtomobil′nye dorogi s derevjanno-gruntovymi pokrytijami. **[Lorry roads with wood-and-earth surfaces for timber transport.]** *Lesn. Prom.* 1959 (11), (18–20). 1 ref. [Russ.russ.]

Describes the design and use of another trial stretch of road [cf. *F.A.* 19 No. 4320] in which tracks made of logs laid lengthwise are placed on each side of the road, directly on the ground vegetation, no levelling, or only very rough grading of the roadbed being done, and the whole then covered with earth. Costs and efficiency compared favourably with those of similar roads without the earth covering.

1907. **Lignin derivative eliminates dusty roads.** *Timberman* 60 (10), 1959 (42–3).

An Oregon lumber company which was spending $5000 per season on watering logging roads has found that a single application of lignin sulphonate, besides laying the dust, gives a semi-permanent 'plastic' road surface that lasts a whole season. The cost was $700–800 less than that of constant watering. Methods of application are described.

384. Protective Works, including Torrent Training

See Nos. 1389, 1394.

385. Drainage, Irrigation, Sedimentation. Water Supply

See No. 1800.

4. FOREST INJURIES AND PROTECTION

See also Nos. 1624, 1819.

1908. Bärner, J. Bibliographie der Pflanzenschutzliteratur, 1952. **[Bibliography of plant protection literature for 1952.]** Biologische Bundesanstalt für Land- und Forstwirtschaft, Berlin-Dahlem. 1959. pp. xli + 433. [G.E.F.]

Comprises > 12,700 classified titles. [Cf. *F.A.* 20 No. 634; 17 No. 1691.]

41. General Technique of Forest Protection. Types of Injury

1909. Potts, S. F. **Equipment for pest and disease control.** *Unasylva* 13 (2; 3), 1959 (89–101; 138–54). 6 refs.

Reviews current equipment and methods of application in North America, for fungicides, insecticides, and weedkillers, including aerial application.

1910. **Plant health regulations governing international trade in forest products.** Organisation for European Economic Co-operation, Paris. 1959. pp. 84.

Answers to a questionnaire addressed in 1958 to the governments of Austria, Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Norway, Portugal, Sweden, Switzerland, Turkey, U.K., U.S.A. and Spain.

1911. Negruckij, S. F. Rezul′taty ispytanija priborov Položenceva i Hanislamova dlja prižiznennoj diagnostiki sostojanija derev′ev. **[Results of testing Položencev's and Hanislamov's instruments for diagnosing the condition of living trees.]** *Bot. Ž.* 44 (7), 1959 (959–62). 1 ref. [Russ.]

Describes four instruments, and the results of tests made on them in 1952–58. All of them work on the principle of determining, in the field, differences in moisture content between tissues from healthy and from sickly trees [cf. *F.A.* 13 No. 942]. Instrument (1) determines the moisture content of the cambial layer by the time taken for a piece of $CoCl_2$ paper in contact with the surface of the tissue to turn from blue to pink. Tests on Oak, Pine, Chestnut, Ash etc., showed that the colour changed more rapidly with samples from healthy trees than with those from sickly ones. Instrument (2) is a variant of (1), and involves determining the evaporation of moisture from the cambium, using $CoCl_2$

paper enclosed in a cylinder along with the sample but not in contact with it. Instrument (3) is a press which squeezes the sap out of a sample of inner bark or wood, the differences in sap content thus obtained indicating different degrees of tree health. This instrument is also used in work involving determination of the sap's coefficient of refraction, pH, colour, osmotic potential, viscosity, etc. Method (4) is based on measurement of the output of the galvano-voltaic cell resulting from the contact of bimetallic (Zn/Fe) electrodes with the moist tissue. All four instruments are said to be highly reliable in distinguishing between healthy and sickly trees, and are light, simple, strong and portable.

1912. ZDRAJKOVSKIJ, D. I. Opredelenie ustojčivosti sosny v očagah kornevoj gubki. **[Determination of the resistance of Pine in foci of *Fomes annosus* infection.]** *Lesn. Hoz.* 11 (12), 1958 (40–2). [Russ.]

Discusses Russian experiments indicating that the moisture content, thickness, pH of extracts, and electrical properties, of the inner bark, the catalase activity of the inner bark and needles, and the starch content of the phloem parenchyma, show differences between healthy trees, trees attacked by *F. annosus* but not by secondary insect pests, and trees attacked by *F. annosus* and secondary pests.

1913. McHUGH, J. J., and BOOTH, H. E. **Gamma-ray measurements of defects in poles and trees.** *Proceedings* [*of the*] *Australian Atomic Energy Symposium* 1958 (615–22). From *abstr.* in *Chem. Abstr.* 53 (18), 1959 (17503). P.R.

[Cf. *F.A.* 21 No. 1151.] Describes the non-destructive detection and measurement of defects using a low intensity γ-ray source, the presence of defects being determined by measuring the variations in γ-ray intensity. Eight possible techniques are discussed, one of which, the equal-intensity method, is described. The best type of γ-ray source for various conditions is determined.

1914. LANGE, S. Untersuchungen über die Anwendbarkeit der Schalldiagnose in der Forstpathologie. **[The use of sound as a diagnostic technique in forest protection.]** *Repr.* from *Wissenschaftliche Zeitschrift der Technischen Hochschule Dresden* 7 (5), 1958 (1045–59). 72 refs. [G.]

Part I describes field and laboratory tests with the Bajuphon sonic detector [cf. *F.A.* 16 No. 1137] equipped with devices for measuring sound intensities and frequencies, on bark-, wood-, and root-inhabiting insects. While interesting data on the relative intensity of sounds, the effect of temperature on feeding, and feeding or rest periods, could be obtained in the laboratory, the utility of the detector in the field was much less. The maximum audibility-distance along a stem from the source of the feeding noise was only ca. 1·5 m., and the creaking of trees even in quite a slight breeze, and other extraneous noises, completely drowned the feeding noise. With screening of wind noises, root feeders in osier beds could be detected. Part II discusses literature (mostly German, Russian and American) on the sonic testing of standing trees for rot and describes tests with a Bajuphon and another amplifying apparatus developed at Tharandt. Tests of objective measurements of frequencies, amplitudes and other sound parameters were not promising.

42. Injuries from Inorganic Agencies other than Fire

421. Air Currents

See also Nos. 1787, 1995.

1915. LESAGE, G. Note sur l'ouragan du 6 juillet 1957 en forêt de Lyons. **[Note on the storm of 6 July 1957 in the Forest of Lyons [,Normandy].]** *Rev. for. franç.* 11 (11), 1959 (737–45). [F.]

Describes the amount and nature of the damage, and the marketing problems resulting from it.

1916. MISHIMA, T., *et al.* **[The actual states of wind damage in the Tomakomai Experiment Forest of Hokkaido University (II). On the natural forest.]** *Res. Bull. Exp. For. Hokkaido Univ.* 19 (1), 1958 (1–39 + 1 map, 9 plates). 12 refs. [Jap.e.]

A second report dealing with 'Typhoon 15' (1954) [cf. *F.A.* 18 No. 532]. Frequency of damage was: leaning > uprooted > stem broken > top broken. On the level site, ca. 45% of the trees were damaged, and 32·4% on both the N. and the S. slope. Some 15 species, mostly broadleaved and all indigenous, are placed in order of wind-firmness.

1917. MIYAJIMA, H. **[Compression failures in wood from trees damaged by Typhoon 15 of 1954.]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (1), 1959 (197–208 + 3 plates). 8 refs. [Jap.jap.e.*e.*]

Studies were made of wind-thrown trees in natural stands and plantations. *Abies mayriana* suffered most heavily, ⅓ of those in the 10–30 cm. diam. class, and ¾ of those in ⩾ 31 cm. classes being destroyed. Losses in broadleaved trees were ca. 21% of the number of trees and of volume. Compression failure was not observed in plantation-grown conifers, which for the most part grew on light volcanic soils and had been uprooted.

1918. PFEFFER, A. Mechanické působení větru na strom. **[The mechanical action of wind on trees.]** *Sbornik Vědeckých Prací Fakulty Lesnické, České Vysoké Učení Technické, Praha* No. 1, 1958 (109–21). 28 refs. [Cz.russ.f.]

Lists the most serious cases of wind damage in Czechoslovakia since 1821, and develops the basic formula

$$P = \frac{d^3}{p.h} \cdot k,$$

where P = wind pressure, d = stem diam. at the critical section, p = crown surface, h = distance between the crown's centre of gravity and the critical section, and k is a constant = $v.\ W$, where v is the permissible bending stress and W the modulus of resistance of a circular section. The way in which changes in one or more of these magnitudes alter the value P is discussed, and illustrated in a table. A further table gives these values for trees of different age classes.

1919. MUELLER, O. P., and CLINE, M. G. **Effects of mechanical soil barriers and soil wetness**

on rooting of trees and soil-mixing by blow-down in central New York. *Soil Sci.* 88 (2), 1959 (107–11). 6 refs. O.R.E.

The dimensions of root systems of windthrown northern hardwoods were studied in relation to mechanically restricting soil horizons and soil wetness. Both dense calcareous glacial till (*a*) and fragipans (2) drastically restricted rooting depth. In soils on (1), increasing soil wetness was associated with small but significant decreases in rooting depth. In soils on (2), both wetness and depth to the fragipan were associated with a pronounced decrease in rooting depth. The volume of soil displaced by uprooted trees was primarily a function of tree size, except where certain soil conditions imposed special limitations. The surface area disturbed increased with increasing tree size in both soil groups, and with increasing wetness in soils on (1). The volume of earth moved depended on wetness, tree size and the character of horizons that restrict rooting mechanically. The data indicate that soil disturbance by windthrow of trees is an important factor in the time taken for soils to develop. *From authors' summary.*

422. Temperature Influences. Frost. Heat. Drought

See also Nos. 1534–5, 1570, 1659, 1821, 2557.

1920. KONDA, K., and MUTO, K. **[Studies on the frost damage of important plantation species in Hokkaido, Japan. (I) Temperature and frost damage. (II) Effect of the morning sun upon the frost damage. (III) The times of frost damage.]** *Res. Bull. Exp. For. Hokkaido Univ.* 19 (1), 1958 (41–121). Many refs. [Jap.e.]

(I) A few of the terminal buds of *Abies mayriana* seedlings were damaged by cooling for 4 hr. at −3° C.; > 50% were damaged by 3 hr. at −4°; and most were damaged by 2 hr. at −5°. When moistened terminal buds were cooled, 72% were damaged by 4 hr. at −3°, and 90% by 3 hr. at −4°. (II) The terminal buds of seedlings of *A. mayriana*, *Picea glehnii*, *P. abies* and *Larix leptolepis* exposed (*a*) directly to temperatures of 10–20° after cooling, were more severely damaged than those exposed (*b*) gradually to the same temperatures. *P. jezoensis* showed no such difference between treatments (*a*) and (*b*). (III) Cooling for 8 hr. at −35° damaged > 50% of the buds on cut shoots of *A. mayriana* and *P. glehnii* before 20th Feb., of *P. abies* on about 20th Feb., and of *L. leptolepis* after this date; 8 hr. at −20° damaged > 50% of the terminal buds of seedlings—70 days before flushing in *A. mayriana*, 60 days before in *P. glehnii*, 50–60 in *P. abies* and 30 in *L. leptolepis*; 8 hr. at −10° damaged > 50% of the terminal buds of seedlings—40 days before flushing in *A. mayriana*, *P. glehnii* and *P. abies*, and 20 days before in *L. leptolepis*; 2 hr. at −5° damaged > 50% of the terminal buds of seedlings—10 days before flushing in *A. mayriana*, 6 days in *P. jezoensis*, 3–8 days in *P. glehnii*, and at flushing in *L. leptolepis*. In *P. abies*, 30% of terminal buds were damaged 5 days before flushing by 2 hr. at −5°.

1921. SARASOLA, A. A. Efectos del sol y de las heladas de invierno en las frutales y forestales. **[Effects of sun and frost on fruit and forest trees.]** *Idia* No. 139, 1959 (17–25). 12 refs. [Span.] C.G.B.

Discusses symptoms of frost injury and sunscald and their causes, and presents notes on some susceptible species and on methods of preventing injury.

1922. ISHIDA, S. **[Freezing point of green Todomatsu-wood.]** *Res. Bull. Exp. For. Hokkaido Univ.* 19 (1), 1959 (123–44). 12 refs. [Jap.e.*e.*]

[Cf. *F.A.* 18 No. 537.] Measurements were made of the freezing points (f.p.) of successive growth rings (from the pith outward) of green wood cut at various heights from normal and frost-cracked *Abies mayriana* stems felled in winter 1957. Freezing curves were obtained for numerous specimens of both wood and bark, and the results incorporated in a table. There were no significant differences between the f.p. of normal and frost-cracked stems; f.p. of the wood ranged from −0·1 to −0·8° C., generally decreasing with decreasing moisture content, and averaged −0·4°. The f.p. of bark was ca. 1° lower than that of the wood. Normal freezing curves, and some with irregularities, are presented and discussed.

1923. RHEINHEIMER, G. Beobachtungen über Trocken- und Hitzeschäden im Sommer 1959 an den wichtigsten Wald- und Strassenbäumen in der Umgebung von Hamburg. **[Observations on heat and drought damage in summer 1959 to the most important forest and street trees in the Hamburg area.]** *Forst- u. Holzw.* 14 (23), 1959 (490–5). 4 refs. [G.]

Compares autumn colouring and leaf-fall in 1958 and 1959 for 41 different tree species in the Jenischpark, Hamburg, and discusses the extent of heat damage (scorched leaves and heavy leaf-fall) for 32 common street trees. Damage is tabulated (3 degrees of severity) for (1) seedlings planted out in spring 1959, (2) well established young plantations, (3) pole-sized stands, and (4) old stands, of 18 forest tree species. In nearly all cases, (1) were killed by the drought. In general, Japanese Larch was the worst sufferer. Pine, Spruce, and Douglas Fir were relatively little damaged. Among the broadleaved species Beech suffered worst.

1924. DUBOIS, J. L. C. Présence de cernes traumatiques dans le bois de *Terminalia superba*. **[The occurrence of traumatic rings in the wood of *T. superba*.]** *Bois For. Trop.* No. 67, 1959 (25–35). 13 refs. [F.e.span.]

In certain parts of the Congo, particularly in the Bangu region, many trees of *T. superba* have traumatic growth rings, which are a serious defect. The author has investigated the causes of these and found them to originate in a 'pedo-climatic imbalance' during the flushing season, occurring on light, permeable soils during periods of deficient rainfall and intense insolation. Trees suffering from this defect (which may be of any size) may often be detected from a peculiarity of the bark—in addition to the normal longitudinal furrows, the bark has transverse cracks, thus forming more or less square scales, often loose at the edges. The anatomy of the traumatic wood is discussed in detail and illustrated by photomicrographs.

424. Soil Conditions. Erosion Effects. Nutrient Deficiencies etc.

See also Nos. 1704–6, 1768–9, 2002, 2150–1.

1925. SÜMEGH, N. Az erdöben levö vízmosásokrói. **[Forest gullies.]** *Erdö* 8 (10), 1959 (385–9). 6 refs. [Hu.russ.g.]

Discusses the extent of sheet and gully erosion in Hungarian forests, giving details of the main causes, with suggested control measures.

1926. GRUCHY, J. H. B. DE. **Water fluctuations as a factor in the life of six of the higher plants of Central Oklahoma.** *Proc. Okla. Acad. Sci.* 37, 1959 (45–6).

Observations were made for 5–6 years on the effects of flooding on 5 woody species and on Bermuda grass. *Fraxinus pennsylvanica* var. *subintegerrima*, *Ulmus americana*, *Cephalanthus occidentalis* and Bermuda grass are all suitable for sites subject to flooding. *Amorpha fruticosa* and *Tamarix gallica* can withstand flooding for ca. 3 months, but will be killed by longer periods.

1927. DUCHAUFOUR, P., and ROUSSEAU, L.-Z. Les phénomènes d'intoxication des plantules de résineux par le manganèse dans les humus forestiers. **[Poisoning of seedlings of conifers by the Mn in forest humus.]** *Rev. for. franç.* 11 (12), 1959 (835–47). 8 refs. [F.]

Chemical analysis of soils from Silver Fir and Spruce stands growing on siliceous soils in the Vosges and calcareous soils in the Jura showed that Mn accumulates in the humus horizons of these soils even when the parent rock contains only traces of it. It is known that the proportion of exchangeable Mn increases at the expense of the less soluble forms when the humus dries out, and in fact it is those types of humus that tend to dry rapidly which are toxic to seedlings. In pot cultures of young Fir seedlings in sands watered with nutrient solutions containing varying quantities of Mn, this toxic effect was confirmed and the threshold of toxicity was found to be 5 p.p.m. in the soil, the toxic effects increasing until total mortality occurs at 100 p.p.m. The symptoms of affected plants were the same in the cultures and in the field, the roots being particularly susceptible. The foliage, always richer in Mn than the roots, is more resistant and converts the Mn into unassimilable forms. Not all humus types from Fir and Spruce forests display the same toxicity to seedlings. This appears to depend on three principal factors: (1) content of exchangeable Mn in the humus, which in turn depends partly on the abundance and rate of decomposition of the needle litter and on pH and Ca content of the humus; (2) the thickness of the toxic humus horizon; and (3) the moisture content of the humus during dry weather. The practical applications of these findings to the regeneration of Spruce and Fir are discussed. [Cf. *F.A.* 21 No. 1349.]

1928. ROUSSEAU, L. Note sur les phénomènes de toxicité de certains humus à l'égard des plantules de sapin (*Abies alba* Mill.) dans les Vosges. **[The toxicity of some humus soils to seedlings of *A. alba* in the Vosges.]** *C.R. Acad. Sci., Paris* 249 (18), 1959 (1802–3). 3 refs. [F.f.] O.R.S. [Cf. preceding abstract.]

1929. WHITNEY, H. S. **An effect of soil-packing in densely crowded coniferous seedlings.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (5), 1959 (1). 1 ref.

An unusual disease associated with packing of soil round the base of *Picea glauca* and *Pinus resinosa* seedlings, observed in the summers of 1958 and 1959 in a nursery at Drummondville, Quebec, appears to be similar to that described for Longleaf Pine seedlings in the south-eastern U.S.A., where killing occurred after 'sand-splash', or 'sand-silt-drift', injury [see Davis, *F.A.* 3 p. 340]. The disease was prevalent where seedlings occurred densely in rows and where wind- and water-borne surface soil had packed firmly round the plants; no abnormality was observed where seedlings were less dense and the adhering soil better aerated. The apical buds and primary leaves of the affected seedlings were necrotic, and fungus mycelium was often observed in the parts of the plant above the soil-pack, but in some cases the entire upper part of the seedling became necrotic, while the lower stem and root system were generally well developed and disease-free. This absence of disease was confirmed when affected seedlings removed from the nursery recovered by adventitious budding in the greenhouse. The killing of the seedlings had previously been attributed to one or more of the facultative soil fungi, *Rhizoctonia solani*, *Fusarium* sp. and several unidentified species having been isolated from the diseased tissues of, and from the soil packed round, the affected seedlings.

425. Chemical Influences (Atmospheric)

1930. ERŠOV, M. F. Vlijanie pyli na rost rastenij. **[The influence of dust on plant growth.]** *Bot. Ž.* 44 (6), 1959 (822–4). 5 refs. [Russ.]

Further experiments [cf. *F.A.* 19 No. 537] were made at Kuibyshev with seedlings of *Caragana aurantiaca* and *Prunus maackii*. Some of the plants were treated with a mixture of fine dust and soot at 2–2·5 g./sq. m. of leaf surface, and this treatment was repeated as necessary, at intervals during the growing season. Height growth of *C. aurantiaca* was 26·6%, and that of *P. maackii* 15·9% less than that of clean controls. Leaf surface area, measured shortly before fall, was 35·3% less than the controls in *C. aurantiaca*, and 20% less in *P. maackii*.

1931. Røykskader i Årdal. **[Smoke damage in Årdal.]** *Extr.* from *Årsmeld. Skogdir., Oslo 1957*, 1959 (18). [Nor.]

It has been necessary to fell ca. 10,000 cu. m. of Scots Pine because of heavy damage caused by fumes from the aluminium works 3 km. away. At Hjelle, 6 km. from the works, damage to the needles is reckoned at 25% and at Vetti, 10 km. away, injury to goats is reported.

43. Forest Fires

See also No. 2504.

1932. BESLEY, L. **A preliminary national research program of forest fire research for Canada** *Pulp.*

Paper Mag. Can. 60 (10), 1959 (279, 282 . . . 290).

A general discussion, with a detailed list of research projects already in being, or proposed, arranged under the O.D.C. heads 431 to 436.

431. Predisposing Factors and Causes. Fire Danger. Fire Behaviour

See also Nos. 1948–9.

1933. COLSON, D. **Thunderstorm analysis in the Northern Rocky Mountains.** *Res. Pap. Intermt. For. Range Exp. Sta.* No. 49, 1957. pp. 10 + 3 sketchmaps, 42 charts, 1 dgm.

The study, part of a larger project, reports and discusses occurrence and movements of thunderstorms during the 1955 fire season, and the meteorological factors associated with them.

1934. MORRIS, W. G. **Effect of weathering on accuracy of fuel-moisture-indicator sticks in the Pacific Northwest.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 171, 1959. pp. 6. 5 refs.

Weight losses per 30 days' exposure varied from 0·67% in the coastal strip of Oregon to 0·27 in the Ochoco mountains and N.E. Oregon.

1935. MCLAREN, A. C. **Propagation of flames in Eucalyptus oil vapour/air mixtures.** *Aust. J. appl. Sci.* 10 (3), 1959 (321–8). 6 refs. P.R.

A preliminary investigation was made to determine the conditions under which flame propagation may occur in Eucalyptus oil-vapour/air mixtures, and to develop methods of quenching the flame. Measurements of the flame velocity (f.v.) as a function of temperature at atmospheric pressure for saturated mixtures of oil vapour and air in a cylindrical reaction tube were made, using spark initiation, and oils from 5 species of Eucalypt were studied. In all cases propagation begins at ca. 60° C., which roughly corresponds to an oil-vapour concentration of 2% by volume. The variation of f.v. with temperature depends on the nature of the oil. For those oils whose constituents have boiling points within a narrow range, f.v. increases to a maximum as the temperature is raised to ca. 70° and then falls to zero at a concentration of ca. 7%. The decrease in f.v. above 70° is due to the mixture becoming too rich in vapour. The oil from *Eucalyptus dives*, whose constituents boil over a wider range of temperature, behaves in a more complex manner. Clouds of ionic salts were shown to be effective in quenching flame propagation. The relevance of these observations to the mechanism of the propagation of Eucalypt forest fires and to methods of control is discussed.

1936. NAKAMURA, S. **Experiments of fire resistance of common trees and shrubs in Japan.** *Repr.* from *Bulletin of the Shimane Agricultural College* No. 7, 1959 (154–64). 15 refs. [E.]

Comparative tests were made on 74 Japanese species [cf. *F.A.* 18 No. 4181] in order to study the critical conditions in which trees and shrubs lose their foliage through combustion and cease to act as a shield against fire. The inflammability of leaves and twigs in actual fires was estimated from tests in electric and gas furnaces [data tabulated], and results obtained for the 'flashing time', i.e. the time taken by leaves to burst into flame after continuous heating at constant temperature, indicate the following sequence of decreasing fire resistance among leaves: (i) conifers, (ii) broadleaved evergreens, (iii) broadleaved deciduous, and (iv) Bamboos. Unless in immediate contact with flames for at least one minute, fresh leaves were not likely to ignite.

1937. LUTZ, H. J. **Aboriginal man and white man as historical causes of fires in the boreal forest, with particular reference to Alaska.** *Bull. Yale Sch. For.* No. 65, 1959. pp. 49. 128 refs.

Based chiefly on literature for the period ending ca. 1915. Indians and Whites burned forests accidentally or intentionally through camp fires, fires for signalling, for repelling insects, for hunting or for obtaining dry fuel. Indians also used fire to melt resin for caulking their Birch-bark canoes, for felling and 'cross-cutting' trees, and the White man for forest clearing, pasture improvement, etc.

1938. ROUSE, G. D. **A theory on forest fires and its explosion.** *Quart. J. For.* 53 (4), 1959 (340–2). 1 ref.

Examination of the combustion of a safety match and the products of combustion indicates that, contrary to what practical experience might lead the forester to believe, the fluctuations in the r.h. of the atmosphere do not influence the amount of heat made available by a match to kindle a forest fire.

432. Prevention and Control

1939. **Forest fires. (Parts 1 and 2.)** *Fire Prot. Rev.* 22 (225; 226), 1959 (474–5, 491; 536, 551). P.R.

Part 1 discusses the use of firebreaks and the provision of picnic places in areas with little fire risk in State forests, and liaison between British Forestry Commission officers and local fire services. Part 2 describes the forest-fire protection facilities and equipment, which include large-scale maps and helicopter services (after local arrangements made in co-operation with R.A.F. and U.S.A.F. stations). In practice, ground-to-ground use of walkie-talkie sets is usually rendered wholly or partly ineffective through severe screening in forest areas.

1940. **New concepts in fire suppression and training. Symposium.** *Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 1851 (*F*-3), 1959. pp. 7 + 3.

Three papers: The fire control training program of the Northeastern Forest Fire Protection Commission (*A. S. Hopkins*); The importance of training in fire protection (*G. L. Miller*); Fire suppression by combat units (*S. A. Fournier*).

1941. ASCHIM, A. O. **Saskatchewan native fire fighter training course.** *Pulp Paper Mag. Can.* 60 (10), 1959 (252–3).

A brief account of the training (started 1956) of native Treaty Indians and Metis who are the main inhabitants of the more remote northern forest areas.

1942. PLATT, C. F. **Aerial suppression planning for Alberta Forest Service.** *Pulp Paper Mag. Can.* 60 (10), 1959 (242 . . . 249).

A general account, stressing the necessity for flexibility and the proper utilization of the various characteristics of fixed-wing aircraft and helicopters.

1943. HESTERBERG, G. A. **Controlling fires in Lake States timber types with sodium-calcium borate.** *Tech. Bull. Ford For. Cent., L'Anse* No. 4, 1959. pp. 21. 2 refs.

Gives a detailed account of a number of tests in which Na Ca borate slurry was applied either from mobile ground units or from aircraft, with evaluation of results in each case. No general conclusions are drawn.

1944. JOHANSEN, R. W. **Monoammonium phosphate shows promise in fire retardant trials.** *Res. Note Stheast. For. Exp. Sta.* No. 137, 1959. pp. 2.

In field trials on 10-year, dry 'rough' plus lopped Pine tops, where head fires burned extremely hotly, $NH_4H_2PO_4$ (MAP) at 1¾ lb./gal. water, dropped from 75 and 100 ft. in 220-gallon loads, stopped the fires within a short distance of the outer edge of the drop zone along a line at least 175 ft. long, while borate (4 lb./gal.) and powdered asbestos (1¼ lb./gal.) did not. Several hours later, the unburned parts of the borate plots could be re-ignited but not the MAP plots. Research is in progress to overcome the corrosiveness of MAP and the difficulty of recognizing treated areas from the air.

1945. **Wetting agents for ground fire mopup.** *Fire Control Notes* 20 (4), 1959 (115–7).

The results of experiments indicate that the use of wetting agents greatly increases the effectiveness of portable pumps for dealing with ground fires, and also tends to retard fires re-invading treated areas. Special pumping equipment may be desirable for the use of 'wet water', but further tests with conventional pumps etc., are in progress.

1946. HILL, L. J. **Fire tanker design.** *Aust. For.* 23 (1), 1959 (4–11).

The design of tankers for forest fire suppression, including alternative types of chassis, pump, tank, and capacity, is discussed. A major advance in recent design has been the use of aluminium in tank construction, with a consequent increase in the water payload.

435. Benefits of Fire Control. Injurious Effects of Fire

See also Nos. 1390–1, 1615.

1947. LYNCH, D. W. **Effects of wildfire on mortality and growth of young Ponderosa Pine trees.** *Res. Note Intermt. For. Range Exp. Sta.* No. 66, 1959. pp. 8. 6 refs.

A study of 1st-, 2nd- and 8th-year mortality of 200 trees in a burned 30- to 40-year-old stand in Washington. All trees with ≥ 90% crown injuries, but only 6–24% of those with < 80% injury, died in the first 2 years, smaller trees being most affected. Bole burning caused no deaths in the first year, but presumably much of the 2nd-year mortality, which was restricted to trees < 6 in. d.b.h. except where crown injury exceeded 80%. Only one tree died after the 2nd year. Crown injuries ≥ 50% reduced 8-year diam. growth in the 6- to 9-in. classes. Height growth was not affected. Small trees showed average or better growth following release through the fire.

436. Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry

See also Nos. 1615, 1639, 1641, 1643.

1948. COUNTRYMAN, C. M., and SCHROEDER, M. J. **Prescribed burn fire climate survey 2-57.** *Tech. Pap. Pacif. Sthwest. For. Range Exp. Sta.* No. 31, 1959. pp. 18. 1 ref.

The second of these studies [cf. *F.A.* 21 No. 610] was designed to determine air flow on the lee side of a ridge roughly at right angles to the prevailing wind in the lower foothills of the Sierra Nevada. Fire behaviour followed closely that predicted from the wind pattern, with a firewhirl developing at places where vertical eddies were indicated in the survey. A case of unexpectedly long-distance spotting across a reservoir suggested that layers of cool air over water or in canyons may contribute to this phenomenon.

1949. COUNTRYMAN, C. M., and SCHROEDER, M. J. **Prescribed burn fire climate survey 3-57.** *Tech. Pap. Pacif. Sthwest. For. Range Exp. Sta.* No. 34, 1959. pp. 15. 1 ref.

The characteristic down-slope winds of the area controlled the fire pattern.

44. Damage by Harmful Plants. Virus Diseases

441. Weeds

See also Nos. 1374, 1582, 1714, 1794–7, 1848, 1859, 1909, 2038, 2611.

1950. BRAID, K. W. **Bracken: a review of the literature.** *Mimeo. Publ. Bur. Pastures Field Crops, Hurley* No. 3/1959, 1959. pp. 69. 462 refs. Price 7*s*. 6*d*.

Covers the habits, ecology, and chemical composition of the plant, poisoning of stock by it, control, utilization, and cost of destruction.

1951. GLOVER, P. E., TRUMP, E. C., and WILLIAMS, R. **Note on mechanical bush clearing.** *E. Afr. agric. J.* 25 (1), 1959 (18–22). 2 refs.

Gives tabulated data on operations carried out by the Kenya Veterinary Department over 6½ years, indicating type of tractor used, type of vegetation, soil type, hire price/tractor/hour, area cleared per hour with (*a*) blade, (*b*) chain, total area cleared and total cost.

1952. GLASGOW, J. P., and DUFFY, B. J. **Bush clearing experiments in the South Nyanza district of Kenya.** *E. Afr. agric. J.* 25 (1), 1959 (31–4). 3 refs.

Small-scale experiments were made to discover a cheap and permanent method of removing the dense evergreen thicket that harbours the tsetse *Glossina pallidipes*. Cutting and burning a 4-acre plot cost 47 man-days per acre, regeneration was 2–5 ft. high in 5 months, and in 3 years the thicket was back to normal. By planting grain crops in the ashes, much of the cost can be recovered, but these crops do not of themselves smother the regeneration. Sugar cane, however, did so effectively. Various species grew fast and thick enough to smother regeneration, but tsetse elimination would require plantations to be kept quite free of undergrowth. Stargrass (*Cynodon* sp.) is perhaps the most effective known method of smothering regeneration and its use is suggested in conjunction with a herbicide such as 2,4,5-T. *From authors' summary.*

1953. BUTTERY, R. F., BENTLEY, J. R., and PLUMB, T. R. **Season of burning affects follow-up chemical control of sprouting Chamise [*Adenostoma fasciculatum*].** *Res. Note Pacif. Sthwest. For. Range Exp. Sta.* No. 154, 1959. pp. 11.

In tests in Mendocino National Forest, burning after crushing by bulldozer, followed by spraying with 2,4-D or 2,4,5-T, gave adequate control in combination with deer browsing, whatever the season, but late-spring burning is recommended for climatic reasons and because it requires only one spraying, which may be delayed until the following spring.

1954. COTNER, M. L., and JAMESON, D. A. **Costs of Juniper control: bulldozing vs. burning individual trees.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 43, 1959. pp. 14.

A study of control operations on Arizona ranges infested by *Juniperus monosperma* and *J. osteosperma*, comparing times per tree and per acre for a 100–125 h.p. bulldozer or burning with propane torches by 1- or 2-man crews. In all but dense stands of large trees, burning is cheaper, with no difference between the two crews.

1955. MADISON, R. W. **Three types of treatment kill brush, make roads safe, easy to maintain.** *Timberman* 60 (13), 1959 (38–9, 68).

Discusses optimum methods of foliage spraying; basal spraying; and slashing with stump spraying, to control brush, encroaching or threatening to encroach, on forest roads in Oregon.

1956. REYNOLDS, H. G. **Brush control in the Southwest.** *Repr.* from *Grasslands*. American Association for the Advancement of Science. 1959. pp. 379–89. 13 refs.

The plants discussed include *Juniperus* spp., chaparral species (including *Quercus turbinella* and *Rhus* spp.), and Mesquite. Causes of invasion, control by manual, mechanical, and chemical methods, and by fire, and the benefits of control are discussed.

1957. LHOSTE, J. Les désherbants chimiques. **[Chemical weedkillers.]** Office de la Recherche Scientifique et Technique Outre-Mer, Paris. 1958. pp. 86. [F.]

Gives classified lists of weedkillers in 3 groups (inorganic substances, mineral oils, organic substances), indicating their chemical and physical properties, toxicity, mode of action, method of application, dosages, susceptible species, etc. There are also lists of weedkillers manufactured in France, and of common European weeds (English and Latin names).

1958. KRYHANOV, L. I. Himičeskie mery sodejstvija lesovozobnovleniju. **[Chemical measures to assist regeneration.]** *Lesn. Hoz.* 11 (10), 1958 (31–4). [Russ.]

Discusses the results of trials in the Leningrad region which showed that the following were sufficient to kill 1 sq. m. of mixed sphagnum mosses: sprays of Na 2,4,5-T (0·3–0·4 g.) or Na 2,4-D (0·5 g.), plus a wetting agent, in at least 100–150 g. water; $KClO_3$ or $Ca(ClO_3)_2$ (10–15 g.), applied dry or in 3–5% solution; $NaNO_2$ (10–20 g.) or potassium thiocyanate (20–30 g.) in 3–8% solution. The best time to apply the chemicals was in June or July, the driest time of the year. In general, slightly higher dosages were necessary to control *Polytrichum*, especially where the moss carpet was deep. With the growth regulators, 1½–2 months was sufficient for the disappearance of adverse effects on germination. Trial sowings of Pine and Spruce, and natural regeneration where there were seed-trees near by, did well. [Cf. *F.A.* 15 p. 384.]

1959. BARÁ, S. Estudios sobre la eliminación del *Cyperus rotundus* L., por herbicidas. **[The control of *C. rotundus* by means of herbicides.]** *Comun. Inst. For. Invest. Exp., Madrid* 30 (8), 1959. pp. 7. 18 refs. [Span.span.]

Presents the preliminary results of experiments in the control of *C. rotundus* in the forest nurseries of the Lourizán Forest Research Centre. Economical and efficient herbicides were found in the following: (1) $NaF + NH_4SCN$ and (2) NaF + 2,4-D. Repeated applications of (2) are recommended, both as a pre-emergence treatment and at time of flowering, at 30 + 0·5 kg./ha.

1960. ROE, E. I. **Determining minimum amounts of herbicide needed for aerial brush control.** *Weeds* 7 (2), 1959 (178–83). 5 refs. From *abstr.* in *Weed Abstr.* 8 (7), 1959 (1307). O.W.

The method consisted of enclosing small, previously prepared plots of brush with 4 walls of plastic sheeting on a frame, left open top and bottom, and then hand spraying them with herbicides at the desired concentration and volume (1–4 gal./acre) to simulate aerial application. The enclosure, spraying equipment, cost, and gang organization are described in detail. The results were generally satisfactory, but some difficulties were experienced when using enclosures on the taller species.

1961. GRATKOWSKI, H. **Effects of herbicides on some important brush species in Southwestern Oregon.** *Res. Pap. Pacif. Nthwest. For. Range Exp. Sta.* No. 31, 1959. pp. 33. 5 refs.

Tabulates results of tests with 6 commercial and experimental herbicides applied as foliage sprays from the ground in midsummer in varying concentrations and carriers. Of the 13 species or varieties treated, 4 were easily killed by low concentrations of 2,4-D in water, 4 were top-killed but tended to resprout, and 5 were highly resistant. 2,4-D is recommended in 8 cases and 2,4,5-T in 5, partly on considerations of cost.

1962. ELWELL, H. M. **Problems in preparation of emulsion sprays for brush control.** *Proc. 12th*

Ann. Sth. Weed Conf. 1959 (111–5). From *abstr.* in *Weed Abstr.* 8 (7), 1959 (1339). O.W.

2,4,5-T oil/water emulsions were best prepared by adding the 2,4,5-T to the oil, then adding water and circulating for ca. 5 min. at 30 lb./sq. in. If the 2,4,5-T/diesel mixture was allowed to stand for 24 hr. a resinous substance separated out which was difficult to disperse. Difficulty was also found in preparing emulsions if the oil contained resins or rust, or the water contained much $CaCO_3$, $MgSO_4$, dispersed clay or organic matter. In mixing invert emulsions the water must be added slowly with constant mechanical agitation; circulation does not suffice. When the invert emulsion had completely separated out (within 24 hr.) it could not be reformed.

1963. **Progress report on invert emulsions.** *Technical Service Data Sheet, American Chemical Paint Co., Ambler* No. *E* 149, 1959. pp. 16. From *abstr.* in *Weed Abstr.* 8 (8), 1959 (1498). O.W.

The characteristics of the following invert emulsions developed by Amchem are presented: ACP-M-414 containing 4 lb. 2,4,5-T acid ingredient (a.i.)/gal.; ACP-M-23A containing 2 lb. 2,4-D + 2 lb. 2,4,5-T a.i./gal.; ACP-M-536 containing 4 lb. 2,4,5-TP a.i./gal.; and ACP-M-754 containing 4 lb. 2,4-D butyric a.i./gal. In another experiment (assessed 1 year after application) basal sprays of ACP-M-414 and ACP-M-23A gave 100% kill of *Quercus alba*, *Q. borealis*, *Q. ilicifolia*, *Q. prinoides* and *Q. velutina*, but only ACP-M-414 gave 100% kill of *Fraxinus americana*, and only ACP-M-23A gave 100% kill of *Prunus serotina* and *Acer rubrum*. Other tables illustrate: the % ground-line kill after 1 year; observations 7 and 9 months after application; the degree of defoliation observed 3 months after aerial application of all 4 formulations; and the % defoliation 4 months after aerial application of Weedone 2,4,5-T (containing 4 lb. 2,4,5-T a.i./gal. as butoxy ethanol ester) and ACP-M-414. Highway and aquatic weed control are mentioned but no details given. General recommendations for ground and aerial application are given, and details of the preparation of emulsion spray mixtures. Finally, a table lists the formulations, acid equivalent, rate/acre and application method for control of general hardwoods, *Q. havardii*, *Prosopis glandulosa*, *Acer macrophyllum* and *A. circinatum* in *Pseudotsuga* sp. and on utility rights-of-way.

1964. DARROW, R. A., MCCULLY, W. G., and HUGHES, E. E. **Woody plant and grass responses to granular applications of fenuron and chlorinated benzoic acids.** *Proc. 12th Ann. Sth. Weed Conf.* 1959 (143–7). 1 ref. From *abstr.* in *Weed Abstr.* 8 (7), 1959 (1310). O.W.

January to May applications of fenuron gave better kills of *Quercus stellata* and *Q. marilandica* than December or July applications. Monuron was generally less effective. Fenuron at 4 lb./acre has given 80–95% root kill under favourable conditions; 6 lb./acre gave poor root kill of *Ilex vomitoria* on a deep sandy soil while 4 lb./acre gave 65–75% root kill on a medium-texture soil. On a limestone soil, rates up to 6 lb./acre gave poor results on *Q. undulata* and *Q. virginiana*, *Diospyros* sp., *Juniperus* sp., *Potentilla fruticosa*, Whitebrush [?], Agarita [?] and *Acacia farnesiana*. On a deep sandy soil, promising results have been obtained on *Q. virginiana*. Promising results on *Q. stellata*, *Q. marilandica* and *Ulmus alata* were given by 2,3,6-TBA at 3–9 lb./acre. It was, however, ineffective on *I. vomitoria*, *A. farnesiana*, *Diospyros* spp., *Q. undulata*, *Q. virginiana*, *P. fruticosa*, Agarita and various *Condalia* spp. Deep-rooted perennial grasses were generally tolerant of 2,3,6-TBA and fenuron, but not of monuron.

1965. HERRON, J. W. **A new concept of brush control using a pelleted material.** *Proc. 15th Ann. Nth. Cent. Weed Control Conf.* 1958 (27–8). From *abstr.* in *Weed Abstr.* 8 (8), 1959 (1503). O.W.

Preliminary results indicate that fenuron pellets at 12–18 lb./acre will kill or severely injure *Fraxinus americana*, *Carya* spp., *Quercus* spp., *Ulmus* spp., *Morus alba*, *Maclura pomifera*, *Juniperus virginiana*, *Acer* sp., *Rhus radicans*, *Celtis occidentalis*, *Cercis canadensis*, *Robinia pseudoacacia* and *Sassafras* sp. *Rhamnus caroliniana* was resistant.

1966. MCILVAIN, E. H., and ARMSTRONG, C. G. **Shinnery Oak control produces more grass.** *Proc. 12th Ann. Sth. Weed Conf.* 1959 (134–7). From *abstr.* in *Weed Abstr.* 8 (7), 1959 (1302). O.W.

2,4,5-T and 2,4,5-TP (esters) gave better control of *Quercus havardii* than 2,4-D. Invert emulsions of 2,4-D, 2,4-DP, 2,4,5-T and 2,4,5-TP gave poorer top-kills than the standard emulsion. Monuron and fenuron at 3–6 lb./acre gave good results but injured grass. For eradication 1 lb. of 2,4,5-T or 2,4,5-TP (low volatile esters) in 3 gal. diesel oil or 2 gal. water + 1 gal. diesel oil between May 10 and June 10 in 3 successive years is recommended; for control 0·5 lb./acre is recommended.

1967. SMITH, J. L. **Tests of injected chemicals for hardwood control in the Arkansas mountains.** *Proc. 12th Ann. Sth. Weed Conf.* 1959 (123–5). 2 refs. From *abstr.* in *Weed Abstr.* 8 (7), 1959 (1303). O.W.

Quercus stellata and *Q. alba* of 3–6 in. d.b.h. were injected in the spring. Two years later, 100% kill had been given by 2,4,5-T (butoxyethanol or 2-ethylhexyl) and 2,4-D + 2,4,5-T (butoxyethanol), 78% kill by 2,4,5-TP (propylene glycol butyl ether), 40% by NH_4 sulphamate and none by 2,3,6-TBA in diesel oil or water, polychlorobenzoic acid in diesel oil, or a 5% solution of amino triazole.

1968. MCCULLY, W. G. **The distribution [of] and possibility of controlling Macartney Rose in Texas.** *Proc. 12th Ann. Sth. Weed Conf.* 1959 (129–33). 7 refs. From *abstr.* in *Weed Abstr.* 8 (7), 1959 (1309). O.W.

Better control of *Rosa bracteata* was given by 2,3,6-TBA than by polychlorobenzoic acid or 2,4-D (all at similar rates). The addition of 25% amino triazole to 2,3,6-TBA did not increase its effect. The optimum rate of 2,3,6-TBA appears to be 3–4 lb. acid equivalent/100 gal. Mown plants required about twice this rate. Granular formulations of 2,3,6-TBA were less effective.

1969. Davis, J. R. **Low-volatile 2,4,5-T effective as basal spray.** *J. For.* 57 (11), 1959 (851).

In tests on 240 small *Liquidambar styraciflua*, a low-volatile ester of 2,4,5-T in diesel oil was as effective as a more dangerous high-volatile ester, also in diesel oil.

1970. Samgin, P. A. Himičeskie sredstva uničtoženija kustarnikov i derev′ev na lugah i pastbiščah. **[Chemical means of eliminating shrubs and trees in meadow and pasture.]** *Vestnik Sel′skohozjajstvennoj Nauki, Moskva* 4 (8), 1959 (126–31). 19 refs. [Russ.e.g.f.] O.W.

Reviews Russian experience in the use of chemical sprays, particularly the butyl ester and Na salt of 2,4-D.

1971. Michel, G. L'élimination des arbustes au moyen de désherbants sélectifs du type 2,4-D et 2,4,5-T. **[Shrub control with selective herbicides of the 2,4-D and 2,4,5-T type.]** *Agricultura, Louvain* 5 (4), 1957 (479–92). 11 refs. [F.f.du.e.] C.G.B.

In trials with various concentrations, solvents, and application methods in the Muhero district of Ruanda Urundi, for the improvement of pasture in thorn savanna, best results (60–75% kills of the shrubs) were obtained by brushing stumps soon after cutting with 2,4,5-T in fuel oil at concentrations $> 0{\cdot}83\%$ (acid equivalent) followed by spraying with a 0·2075 aqueous solution later in the year. *Acacia caffra* var. *campylacantha*, *A. sieberiana*, and *Capparis* spp. were highly susceptible, and *A. seyal*, *Dorylis macrocalyx* and *Grewia similis* very resistant.

1972. **[Arboricide and herbicide trials.]** *Report, W. African Rice Research Station, Sierra Leone* 1957 (10–4). From *abstr.* in *Weed Abstr.* 8 (6), 1959 (1071). O.W.

Includes results of a trial in which 2,4-D and 2,4,5-T (butyl esters) at 0·25 and 1% in diesel oil were applied to isolated clumps of *Raphia gracilis*, immediately after cutting back to ground level, and 1 week later when the young shoots were sprouting. Only the lower rate of 2,4-D at the later date was followed by any appreciable resprouting.

442. Parasitic (Higher) Plants. Epiphytes. Climbers

1973. Graham, D. P. **Dwarfmistletoe survey in Kootenai National Forest.** *Res. Note Intermt. For. Range Exp. Sta.* No. 67, 1959. pp. 5.

In a roadside survey in 1957, ca. 70% of all *Larix occidentalis* stands were found to be infested with *Arceuthobium* sp. Incidence was greatest in merchantable stands, independent of type, and least in even-aged small poles and saplings without overstorey. Infected stands of *Pinus contorta* were also found throughout the forest. *From author's summary.*

1974. Graham, D. P. **Dwarfmistletoe survey in Coeur-d'Alène National Forest.** *Res. Note Intermt. For. Range Exp. Sta.* No. 68, 1959. pp. 5.

[Cf. preceding abstr.] Ca. 64% of the Larch stands were infested. In addition, the parasite was found on Douglas Fir, Lodgepole Pine, and Mountain Hemlock. *From author's summary.*

1975. Kimmey, J. W., and Mielke, J. L. **Western dwarf mistletoe [*Arceuthobium campylopodum* f. *campylopodum*] on Ponderosa Pine.** *For. Pest Leafl. U.S. For. Serv.* No. 40, 1959. pp. 7. 6 refs.

Hosts, methods of spread, symptoms of infection, damage, and control.

1976. Roth, L. F. **Natural emplacement of dwarfmistletoe seed on Ponderosa Pine.** *For. Sci.* 5 (4), 1959 (365–9). 11 refs.

Investigates the relationship between the dispersal of seed and the prevalence of *Arceuthobium campylopodum* f. *campylopodum* on *Pinus ponderosa* in central Oregon. The mechanism of transfer of gelatinized seeds from the needles to susceptible parts of the stem (usually in the axil or at the opening of the fascicle) is described.

1977. Anderson, R. L., and Kaufert, F. H. **Brooming response of Black Spruce to dwarf mistletoe infection.** *For. Sci.* 5 (4), 1959 (356–64). 14 refs.

Describes the variations in the reaction of the host, *Picea mariana*, to damage by *Arceuthobium pusillum*, which almost invariably stimulates the development of witches' brooms. Three types of broom are recognized: (*a*) bush type, (*b*) leader-type, and (*c*) weak type. Data collected on 273 infected trees and 728 brooms from 12 permanent study plots established in 1948 in extensive *P. mariana* stands in Minnesota swamps, indicated that the form of broom is apparently determined by host vigour and age. In very young trees the original stem may be wholly eliminated by the infection, leaving a tree-shaped broom of type (*b*) that gives a false impression of systemic infection. For the first 5–10 years brooms grow very rapidly, and the mistletoe produces much seed. A marked decline in stem growth and considerable mortality resulted from infections, especially in younger trees, and usually $\nless 75\%$ of the foliage of dying trees is found on infected branches. Older trees survived as long as 45–50 years after infection.

443. Fungi and Bacteria

See also Nos. 1725, 1768, 1774, 1819, 2089, 2150.

1978. Moore, W. C. **British parasitic fungi: host-parasite index and a guide to British literature on the fungus diseases of cultivated plants.** Cambridge University Press, London and New York. 1959. pp. xvi + 430. 4 pp. of refs. + many refs. in text.

Part I consists of a single alphabetical list of the scientific and common names of hosts, with an alphabetical list, under the scientific name of each, of the fungus parasites recorded. Part II consists of an alphabetical list of the parasites with, for each, the diseases it causes, their distribution and prevalence, references to literature, etc.

1979. Krstić, M. Nezabeležene fitopatološke pojave u rasadnicima i šumama Srbije. **[Unreported phytopathological phenomena in nurseries and forests of Serbia.]** *Zašt. Bilja* 45, 1958 (75–9 + 2 plates). 5 refs. [Serb.e.] I.M.I.

The following important diseases have been reported: (1) bark necrosis of 4-year *Platanus* *orientalis* due to *Discula platani*, (2) yellow bark necrosis of 4-year *Robinia pseudoacacia* due to *Phoma* (*Phomopsis*) *pseudoacaciae*, and (3) red spot of needles of 29-year *Pinus nigra* due to *Actinothyrium marginatum*; (1) and (2) have caused dieback of several hundred young trees; (3) occurred in a rather dense stand previously suffering from bark-beetle attack. Other pathogens observed were *Phoma* (*Phomopsis*) *sophorae* on *Sophora japonica* shoots, *Cytospora ambiens* on *Morus alba* shoots, *Sclerophoma magnusiana* on bark of *Pinus peuce*, *Gloeosporium catalpae* on *Catalpa speciosa* leaves, *Phyllosticta prunicola* on *Prunus serotina* leaves, *Cladosporium herbarum* on *Pinus strobus* needles, *Phyllosticta fraxini* in *Fraxinus americana* seeds, and *Ganoderma lucidum* on *Robinia pseudoacacia* roots. *From author's summary.*

1980. WALLWITZ, G. VON. Die Pappelkrankheiten, nach den neuesten Unterlagen der FAO und der Bundesrepublik zusammengestellt. **[Diseases of Poplar. Compiled from the latest FAO and W. German sources.]** *Allg. Forst- u. Jagdztg.* 130 (11/12), 1959 (281–4). 7 refs. [G.]

Tabulates, for the chief diseases of bark and foliage and for root and stem rots and seedling diseases, their German names (often with French, Italian or English equivalents), pathogens where known, a description of the injury and the pathogen, their distribution, and varietal susceptibility or resistance of the hosts [cf. *F.A.* 20 No. 1495].

Fungi and Bacteria: Chemical Control

See also Nos. 1909, 1985–8, 2005, 2009, 2014, 2017.

1981. GOVINDASWAMY, C. V. **Preliminary experiments on fungitoxicity and phytotoxicity of some petroleum oils.** *Rep. Agric. Hort. Res. Sta. Univ. Bristol 1958*, 1959 (131–8). 5 refs.

Having regard to recent use of mineral oils as direct fungicides, tests were made on the fungitoxicity and phytotoxicity of (*a*) a white oil, (*b*) spindle oil and (*c*) diesel oil. It was found that 1% (*b*) and (*c*) markedly reduced germination of spores of *Botrytis cinerea* and slightly reduced that of *Cladosporium fulvum*; (*a*) up to 10% had little effect. Germination of spores of *Alternaria tenuis* was unaffected by any of the oil emulsions tested. All the emulsions had an inhibiting effect on the mycelial growth of the three fungi and of *Penicillium* sp.; they did not check sporulation of *C. fulvum*, or discharge of ascospores of *Nectria galligena* and *Pseudopeziza ribis*. Phytotoxic effects were tested in the greenhouse on 9 crop plants. At 1% concentration, (*a*) and (*c*) were harmless to all crops tested; at 5% (*b*) was generally more phytocidal than (*a*) or (*c*); at 10% all three caused some damage to almost all crops.

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See also Nos. 1691–3, 1929.

1982. PRISJAŽNJUK, A. A. Bolezni semjan i plodov drevesnyh i kustarnikovyh porod i mery bor'by s nimi. **[Diseases of seeds and fruits of trees and shrubs, and control measures.]** *Doklady Naučnoj Konferencii po Zaščite Rastenij, Vilnius 1958*, 1959 (129–36). 31 refs. [Russ.russ.]

A review of Russian work. Ca. 270 species of fungi have been observed, 185 of them Fungi Imperfecti, 18 Basidiomycetes, 53 Ascomycetes, and 14 Phycomycetes.

1983. ORLOVA, A. A., and EVSEENKO, I. D. O vlijanii griba sklerotinii na prorastanie želudej i razvitie sejancev. **[The influence of *Sclerotinia* on the germination of acorns and the growth of seedlings.]** *Lesn. Hoz.* 11 (7), 1958 (40–2). [Russ.]

After pilot experiments, acorns damaged by *Sclerotinia pseudotuberosa* (1) were divided into lots with (*a*) $\frac{1}{3}$, (*b*) $\frac{1}{3}$–$\frac{1}{2}$, and (*c*) $\frac{1}{2}$–$\frac{2}{3}$ of the cotyledon surface attacked; and healthy acorns (2) had (*a*) $\frac{1}{3}$, (*b*) $\frac{1}{3}$–$\frac{1}{2}$, and (*c*) $\frac{1}{2}$–$\frac{2}{3}$ of the cotyledons removed. The germination of (1) and (2) was compared, using whole, healthy acorns as controls. Germination and development of (1*a*) and (1*b*) were equal to those of (2*a*) and (2*b*) respectively, but (1*c*) gave only 30% germination while (2*c*) gave 70%. It is concluded, *inter alia*, that the development of *Sclerotinia* in the acorn ceases when it is sown, and the mycelium does not spread in the soil and attack healthy acorns. The fungus, even when developing in the closest proximity to the embryo root and shoot, has no toxic effect, its chief effect being to reduce the nutrient supply from the cotyledons. The disease is not transmitted from the acorn to the seedling.

1984. VAMOS, R., and VIDA, L. **Antibacterial substances of coniferous seedlings at different stages of their development.** *Nature, Lond.* 184 (4690), 1959 (915). 4 refs.

Seedlings of *Pinus sylvestris* and *P. nigra* were examined before and after the appearance of the foliage leaves and at the age of 1 year. Studies of possible antibiotic extractives were made with a number of test organisms, from which the following conclusions are drawn: (1) The seedlings contain no antimicrobiotic substances before the appearance of foliage leaves. (2) The substance extracted from seedlings after foliage leaves appear and from 1-year seedlings, inhibits Gram-positive bacteria. (3) This substance has no antifungal effect, and therefore offers no defence against damping-off fungi. The decline in incidence of damping-off after the formation of the antibacterial substance suggests that the Gram-positive soil bacteria must have a certain role in the damping-off of coniferous seedlings.

1985. COCKERILL, J. **Effectiveness of fungicidal applications on damping-off of Red Pine.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (4), 1959 (2).

The fungicides Tersan, captan, and Thioneb were applied to seedbeds as drenches at the rate of 0·5, 1·0, 1·5, 2·0, 2·5, 3·0, and 3·5 g./sq. ft., at weekly intervals. All treatments gave a reduction in damping off, effectiveness increasing with increasing concentration. There was no significant difference between the three chemicals, either in reduction of mortality or in emergence of seedlings.

1986. SATO, K., SHOJI, T., and OTA, N. **[Studies on the snow molding of coniferous seedlings—I. Gray mold and sclerotial disease.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 110, 1959. pp. 153 + 16 plates. 159 refs. [Jap.e.*e.*]

A detailed study of the 'gray mould' caused by *Botrytis cinerea* on *Cryptomeria japonica* and *Pinus densiflora*, and a snow mould caused by *Sclerotinia kitajimana* on the same species, including inoculation experiments and control with various sprays and dusts. There is a 7-page English résumé. [Cf. *F.A.* 19 No. 3145.]

1987. NOHARA, Y., and ZINNO, Y. **[Researches on the prevention of the needle blight of 'Sugi' (*Cryptomeria japonica* D. Don) [caused by *Cercospora cryptomeriae*] (VI). Dosages and numbers of dusting times of the fungicide. (VII). Some experiments with a type of mist sprayer designed to suit forest nursery.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 112, 1959 (1–22). 8 refs. [Jap.e.*e.*]

(VI) Seedlings in a forest nursery were dusted with a fungicide containing Cu_2O at dosages of 6, 4½, 3, and 1½ kg./sq. m., and 9, 8, or 7 times a year. Preventive effect increased in proportion to the dosage, but no close relation was observed between effectiveness and frequency of dusting. [Cf. *F.A.* 18 Nos. 2997–8.] (VII). The authors have designed a mist sprayer [not described in the English summary] which in field tests sprayed 6 times the area per day that ordinary sprayers could do. Tests with Bordeaux mixture on *C. japonica* showed that high concentrations applied by this sprayer gave as good protection as greater quantities of more diluted concentrations with standard sprayers. The effective range of the sprayer is 5–6 m.

1988. INMAN, R. E., and WEIHING, J. L. **Cyprex: a superior control for shothole disease of Chokecherry.** *Tree Plant. Notes* No. 37, 1959 (27–30).

Chokecherry [*Prunus virginiana*], a useful shelterbelt species, is subject to outbreaks of disease caused by *Coccomyces lutescens*. Of a number of sprays tested for control of this fungus in the nursery, the most effective was Cyprex (active ingredient dodecylguanidine acetate 70%).

443.3. Diseases of Older Stages

Stem, Butt and Root Rots; Root Diseases

See also Nos. 1491, 1654, 1912–4.

1989. PATTON, R. F., and RIKER, A. J. **Artificial inoculations of Pine and Spruce trees with *Armillaria mellea*.** *Phytopathology* 49 (9), 1959 (615–22). 27 refs.

A. mellea attacked and killed apparently healthy, vigorously growing trees in 7- to 10-year-old coniferous plantations in Wisconsin. Red, White and Jack Pines and White Spruce were artificially inoculated in experiments with pot plants. Cross-inoculations showed that 4 isolates from different suscepts were capable of infecting species other than those from which the isolates were obtained. In field experiments with Red and White Pine, 21 out of 79 inoculated trees became infected.

1990. MORIONDO, F. Un singolare attacco di *Armillaria* sp. su *Robinia pseudoacacia* L. **[A peculiar attack by *Armillaria mellea* on *R. pseudoacacia*.]** *Ital. for. mont.* 14 (5), 1959 (207–9 + 7 photos). 6 refs. [It.it.f.]

The attack began from a small initial focus in an uneven-aged stand of coppice origin, and is spreading at a rate of ca. 2000 sq. m. annually. Trees of all ages > 2 years are attacked, but none has so far died. The first symptom is a swelling at the root collar, and infection spreads upwards in the wood. Roots appear to be free from infection. Trees react vigorously by the continuous formation of cork barriers, which the fungus successfully penetrates. At present there appears to be an interesting state of equilibrium between the tree and the fungus.

1991. VARGHESE, G., and MCNABB, H. S. **Growth of *Armillaria mellea* at alternating and constant temperatures.** *Abstr.* in *Phytopathology* 49 (9), 1959 (553).

Alternating temperatures tended to favour mycelial development over rhizomorphs.

1992. MEREDITH, D. S. **The infection of Pine stumps by *Fomes annosus* and other fungi.** *Ann. Bot., Lond.* (*n.s.*) 23 (91), 1959 (455–76). 23 refs. O.R.E.

[Cf. *F.A.* 20 No. 707.] A study of the stump-colonizing fungi in *Pinus sylvestris* and *P. nigra* var. *calabrica* plantations in E. Anglia showed that certain species (e.g. *Fomes annosus*, *Peniophora gigantea*, *Stereum sanguinolentum*, and several causing blue-stain) initiate infection of fresh stumps by means of air-borne spores that colonize the cut surface. The incidence of natural infection is considerably reduced by creosoting the cut surface immediately after felling. High resin content of stumps was correlated with increased resistance to infection. Marked seasonal variation in the incidence of stump infection by *F. annosus* and *P. gigantea* was observed. The spore content of the air, and competition between fungi on stumps, are considered to be important factors affecting this variation. Initial colonization of stump roots usually proceeds from the body of the stump. Invasion of roots by saprophytes present in the soil or litter also occurs, but only many months after felling. Crowns of plantation Pines may bear many spores of stump-colonizing fungi, including *F. annosus*. Under the conditions described, the proportion of stump infections ascribable to rain-splash-borne spores was small compared with that caused by wind-borne spores. *From author's summary.*

1993. CH'ÊN, L.-P., and CH'IU, T.-H. **[Fungi of *Abies* stands in the Ma-êrh-k'ang leskhoz, Szechwan province.]** *For. Sci., Peking* 1959 (2), (134–42). 4 refs. [Chin.russ.]

In these *A. faxoniana* and *A. recurvata* stands, on average 78·6% of the trees (87·5% by volume), are damaged by fungi. *Fomes annosus* accounts for 19·7% of the trees damaged (18·6% by volume) and *F. fomentarius* for 10·9 and 14·1% respectively. Damage is worst in *Abies*/*Rhododendron* stands, and least in *Abies*/Bamboo stands; damage is the higher, the lower the site class, the older the stands, and the less their density; it is worst on N.E. slopes, and least on W. slopes. Timber yields are reduced by 69·5% by *Trametes abietis*, 22·5% by *F. annosus*, and 10·6% by *F. fomentarius*.

1994. GAVRILOV, A. P. Vlijanie gribnyh zabolevanij na vyhod delovoj drevesiny i vozrast spelosti v tipe lesa pihtač kočedyžnikovyh. **[The influence of fungus diseases on the yield of commercial timber and age of technical maturity in *Athyrium*-type Fir forests.]** *Lesn. Hoz.* 11 (11), 1958 (78–9). [Russ.]

Traces the increase of butt rot with age in *Abies sibirica* on 4 sample plots at Shchuche-Ozero, in the Central Urals, and the effect of this on yields and on the exploitable age of the forest. In healthy stands m.a.i. in terms of merchantable wood culminates at 110 years; in stands suffering from decay, at 90.

1995. STILLWELL, M. A. **Further studies of the pathological deterioration in wind-thrown Balsam Fir in Newfoundland.** *For. Chron.* 35 (3), 1959 (212–8). 4 refs.

[Cf. *F.A.* 15 No. 352.] The rate of pathological deterioration was determined for 175 windthrown Balsam Firs, 4–8 years after death. Incipient sapwood decay decreased from 32 to 13% of total gross merchantable volume from the 4th to the 8th year, while the volume of 'unfirm' [decayed] sapwood increased from 2 to 45%. All trees examined in the 7th and 8th years contained unfirm sapwood decay, with average depth of radial penetration 0·5 and 0·8 in. respectively. *Stereum sanguinolentum* and *S. chailletii* were the two main fungi associated with incipient decay. Advanced decay was caused chiefly by *Lenzites saepiaria*, with *Polyporus abietinus* making up most of the balance. *From author's abstract.*

1996. EADES, H. W., and ROFF, J. W. **Red heart stain of Lodgepole Pine logs in the southern interior of British Columbia.** *Mimeo. For. Prod. Lab. Can.* No. *V* 1025, 1959. pp. 11. 14 refs.

Portions of logs or tops from > 1200 trees in 8 different areas were examined. *Fomes pini* was isolated in 66% of stained samples, and all of the advanced decay was also caused by this fungus. *Stereum pini* was found in 12% of stained samples. One Fungus Imperfectus (*Rhinocladiella atrovirens*) was found to be capable of causing red stain similar to that of incipient decay.

1997. KAMEI, S., and IGARASHI, T. **[On the brown cubical butt rot of Larch, Firs and other conifers caused by *Sparassis crispa* (Wulf.) Fr. in Japan.]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (1), 1959 (77–92 + 6 plates). 32 refs. [Jap.e.*e.*]

In the course of a survey of windthrown trees after the typhoon of Sept. 1954, many trees in the forests of Hokkaido were found to suffer from a butt rot caused by the edible fungus *Sparassis crispa*. The species attacked were *Larix leptolepis*, *Abies mayriana*, *Picea jezoensis* and *P. glehnii*, and trees of ⩾ 30 years, in natural stands and in plantations, were involved. Decay begins in lateral roots and extends to a height of ca. 3 m. up the stem. Studies were made of pure cultures of the mycelia from decayed trees. Very few records are extant of butt rot caused by this fungus [cf. *F.A.* 13 No. 3978].

1998. SILVERBORG, S. B. **Rate of decay in northern hardwoods following artificial inoculation with some common heartrot fungi.** *For. Sci.* 5 (3), 1959 (223–8). 7 refs.

The results of a 5-year study on the rate of decay, canker development and sporophore formation in four northern hardwood species after artificial inoculation with some common heart-rot fungi, are summarized as follows. (1) *Fomes igniarius* in Bigtooth Aspen (*Populus grandidentata*) caused the greatest amount of vertical decay (9·5 ft.) in 5 years. Other fungi causing extensive decay were *F. applanatus* in Beech (*Fagus grandifolia*) (5·6 ft.), *F. igniarius* in Beech (4·8 ft.), and *Polyporus glomeratus* in Maple (*Acer saccharum*) (2·8 ft.). (2) *F. igniarius* in Maple, *Poria obliqua* in Yellow Birch (*Betula lutea*), and *Polyporus glomeratus* in Beech caused only limited decay. (3) Cankers were formed on Beech by both *F. igniarius* and *F. applanatus* 3 years after inoculation. (4) Abortive sporophores of *F. igniarius* first appeared on Bigtooth Aspen and Beech 4 years after inoculation. The following year a single layer of tubes had formed. (5) Young sporophores of *F. igniarius* on Beech indicate only limited decay. On Bigtooth Aspen, however, decay caused by *F. igniarius* is extensive when the conks first become visible.

1999. DŽAFAROV, S. A. Novyj parazitnyj grib na kaštanolistnom dube. **[A new parasitic fungus on *Quercus castaneifolia*.]** *Lesn. Hoz.* 11 (7), 1958 (42–3). [Russ.]

Reports *Ganoderma resinaceum* f. *quereinum* [*quercinum*] f. nov. on *Q. castaneifolia* in the forests of the extreme S.E. of Azerbaijan. On various sample plots ca. 20% of trees 100 years old, and 100% of trees 250 years old, were infected.

2000. MIKALAJKEVIČUS, V. Ložnyj osinovyj trutovik v lesah Litovskoj SSR i nekotorye ego biologičeskie osobennosti. **[*Phellinus tremulae* in Lithuanian forests, and some of its biological features.]** *Doklady Naučnoj Konferencii po Zaščite Rastenij, Vilnius 1958*, 1959 (321–8). 6 refs. [Russ.russ.]

From investigations in 1953–57, it was concluded that the extent of *P. tremulae* spread depends on the age of the *Populus tremula* stands: at 30 years, a few trees carry sporophores of *P. tremulae*, at 50 years 50% of the trees do, and ⩾ 70 years ca. 100%. Checked trees are damaged by heartrot far more than well developed trees. Sporulation begins in the spring and continues on and off until late autumn. The most important silvicultural measures to control *P. tremulae* are: to increase the rate of Poplar growth, particularly diameter growth, and reduce the rotation age; to carry out thinnings in 31- to 40-year stands, removing trees that bear sporophores; to prune dead branches; to prevent damage to the stand, expecially after the appearance of sporophores on some of the trees; to carry out thinnings during the driest season; to avoid breaking off living branches during thinnings.

2001. BAKSHI, B. K., and BOYCE, J. S. ***Polyporus shoreae* root rot on Sal.** *Indian For.* 85 (11), 1959 (656–8). 3 refs.

A root-rot disease of Sal caused by *P. shoreae* results in top dying and death of trees in N. Bengal and Assam. In many cases the dying trees become windthrown owing to root decay. The disease is correlated with high rainfall. The fungus infects through healthy uninjured roots, causing decay in the bark and sapwood. Heartwood is unaffected. The decay does not normally progress into the stem. Until the disease is worked out, control measures suggested include removal of dying and dead trees and practising controlled burning to reduce soil moisture. *From authors' summary.*

2002. NEWHOOK, F. J. **The association of *Phytophthora* spp. with mortality of *Pinus radiata* and other conifers. 1. Symptoms and epidemiology in shelterbelts.** *N.Z.J. agric. Res.* 2 (4), 1959 (808–43). 16 refs. O.R.E.

[Cf. *F.A.* 21 No. 637.]. A disease, the primary symptom of which is the death of feeding rootlets, has been killing large numbers of conifers in New Zealand. A highly significant correlation was found between the presence of *Phytophthora* spp. and disease symptoms in shelterbelts, and a significant correlation between severity of external symptoms and abundance of *Phytophthora* spp. in the soil. *Phytophthora* populations were concentrated mainly in the tree-rootlet zones, and could persist in the soil for ⩾ 2 years after the death of the trees. *P. radiata* was highly susceptible up to 4–5 years, but thereafter resistant until 20–30 years. Epidemics occurred only in years in which there was abnormally early wetting of the soil in autumn, with wet conditions persisting until spring. Symptom expression depends on the destruction of the balance between transpiration demand and absorptive capacity of the root system. The disease is considered to be basically the same as that observed on *P. echinata* in the S.E. of the U.S.A. [cf. *F.A.* 11 No. 661]. The limitations of fertilizing, drainage, application of fungicides, and breeding or selection for resistance, are pointed out. The most satisfactory answer is to change from using *P. radiata* and the other susceptible traditional shelterbelt species, to species found to be locally suitable and resistant to *Phytophthora* attack. *From author's summary.*

2003. HUNT, J. ***Phytophthora lateralis* on Port-Orford Cedar.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 172, 1959. pp. 6. 6 refs.

Describes the continuing spread of the disease within the natural range of *Chamaecyparis lawsoniana*, the symptoms, methods of spread etc.

Wilts, Diebacks etc.

See also Nos. 2128–9.

2004. WOOD, F. A., and PETERSON, J. E. **Fungi isolated from Oak-wilt-infected and apparently healthy Oak trees.** *Abstr.* in *Phytopathology* 49 (9), 1959 (555).

Isolates (1446) of fungi taken from 400 wilted Oak trees comprised 65 genera and a number of unknowns. *Ceratocystis fagacearum* was isolated from 373 of the 400 wilted trees. Isolates (169) from 50 healthy trees comprised ca. 35 genera. *Hypoxylon punctulatum* was isolated from 40% of both wilted and healthy trees, and from 70% of the 27 wilted trees that did not yield *C. fagacearum.* There was no apparent specificity of any fungi for particular *Quercus* spp.

2005. SCHOENEWEISS, D. F. **Xylem formation as a factor in Oak wilt resistance.** *Phytopathology* 49 (6), 1959 (335–7). 2 refs.

[Cf. *F.A.* 20 No. 3349.] To investigate whether the greater resistance of White Oaks than of Red or Black Oaks had a morphological basis, sections from branches of naturally or artificially infected White Oaks were examined. Each section showed a clearly defined band of large open vessels outside the band of plugged early-wood vessels. The bands, both laid down in the year of infection, were separated by a line of very small cells which may have formed a barrier for the pathogen. Subsequent annual rings were apparently also healthy. When in field tests with systemics a *Quercus palustris* was injected with 1500 ml. of 1000 p.p.m. Vancide 51, and 2 days later infected with the wilt, sections of branches taken a year later revealed a ring of open vessels almost identical with that found in the White Oaks, but laid down in the year following the year of infection. The tree was still alive a year later.

2006. ROTH, E. R., HEPTING, G. H., and TOOLE, E. R. **Sapstreak disease of Sugar Maple and Yellow Poplar in North Carolina.** *Res. Note Stheast. For. Exp. Sta.* No. 134, 1959. pp. 2. 3 refs.

Reports on a series of tests between 1940 and 1951 at Barnardsville, where a total of 152 *Acer saccharum* and 120 *Liriodendron tulipifera* were inoculated with *Ceratocystis coerulescens*. The cultures were isolated from diseased *A. saccharum* and from the only two *L. tulipifera* found diseased since 1949, and also from blue-stained *L. tulipifera* lumber; each proved capable of producing the disease. Mortality after inoculation, however, amounted to only 14% for *A. saccharum* and 4% for *L. tulipifera.* It is evident that *C. coerulescens* may live in the boles of these species for many years before causing visible crown symptoms, though once it has spread beyond the insulated area, death occurs in 1–3 years.

2007. CAROSELLI, N. E. **The relation of sapwood moisture content to the incidence of Maple wilt caused by *Verticillium albo-atrum*.** *Phytopathology* 49 (8), 1959 (496–8). 8 refs.

Norway Maple [*Acer platanoides*] trees were inoculated with *U. albo-atrum*, and either permitted a natural water supply or provided with supplemental water applied directly into the sapwood. Average wilt and extent of sapwood discoloration was less in those given additional water. Severity of wilt symptoms and sapwood discoloration were less in trees having a greater sapwood moisture content. *Author's summary.*

Cankers, Stem Rusts etc.

See also No. 1774.

2008. RAMBELLI, A. La cosiddetta batteriosi del pioppo. **[The 'bacterial disease' of Poplar.]** *Pubbl. Cent. Sper. Agric. For., Roma* 2, 1959 (233–42 + 1 plate). 8 refs. [It.it.e.*e*.]

[Cf. *F.A.* 20 No. 4798.] Discusses factors possibly involved in the disorder, e.g. insolation; root competition; pedological and hydrological disequilibrium; and over-wide spacing in plantations on fresh soils.

2009. SCHÖNHAR, S. Spritzversuche gegen *Dothichiza populea* mit verschiedenen Fungiziden. **[Spraying tests with various fungicides for the control of *D. populea*.]** *Allg. Forstzeitschr.* 14 (47), 1959 (824–5). 2 refs. [G.g.]

Presents tabulated results for 8 preparations sprayed 3 times during the growing seasons 1957 and 1958 in 4 nurseries, mostly on one-year rooted cuttings of *Populus* × *robusta*. $CuOCl_2$ (50% Cu), a basic Cu salt (27% Cu) and Cu_2O (35% Cu) were judged reasonably effective, and captan, a Cu/S preparation, and an organic Zn compound moderately successful in reducing (though not preventing) attack. The Cu preparations were sprayed as 0·5% the others as 0·3% aqueous suspensions.

2010. BIER, J. E. **Moisture relations in disease development with particular reference to canker diseases caused by native, facultative parasites.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (4), 1959 (3–4).

Recent studies reveal a close correlation between the development of *Cryptodiaporthe salicina* canker on Willow, *Fusarium lateritium* on *Populus trichocarpa*, and *Cephalosporium* sp. on Western Hemlock, and the moisture content of the living host bark. When bark m.c. was expressed as a % of the amount of water required to saturate the sample under experimental conditions, relative turgidities of ⩾ 80% inhibited canker development which, however, occurred normally at lower %s. It is possible, therefore, that relative turgidity measurements provide indices for the determination of the resistance or susceptibility of the host trees to this type of disease. Further, the experiments indicate the importance of maintaining a satisfactory level of relative turgidity in the bark of trees and cutting stock as a cultural method designed to prevent these diseases.

2011. BIER, J. E. **The relation of bark moisture to the development of canker diseases caused by native facultative parasites. II. *Fusarium* canker on Black Cottonwood.** *Repr.* from *Canad. J. Bot.* 37, 1959 (781–8 + 3 plates).

A close correlation was found between canker of nursery-grown *Populus trichocarpa* caused by *F. lateritium* and the moisture content of the living bark. The limiting relative turgidity was 80%, as for *Cryptodiaporthe salicina* on *Salix* spp. [cf. *F.A.* 21 No. 648] and results similar to those for *C. salicina* were obtained in a study of canker growth during the dormant and growing seasons. Canker development in dormant cuttings during the winter was prevented by standing them in water, thus increasing their relative turgidity to above 80%. During the dormant season the bark of field-grown trees maintained relative turgidities of 80% or more, and no disease was found in them.

2012. BIER, J. E. **The relation of bark moisture to the development of canker diseases caused by native, facultative parasites. III. *Cephalosporium* canker on Western Hemlock.** *Repr.* from *Canad. J. Bot.* 37, 1959 (1140–2 + 1 plate).

[Cf. *F.A.* 21 No. 648.] In the dormant season of 1958–59, bark moisture measurements made in the University Forest, Vancouver, showed lower relative turgidities in 5- to 10-year-old bark of suppressed trees (62–88%) than in similar-aged bark in open-grown trees, and, within trees of the understorey, in lower branches with thinner foliage (55–76%) than in the more vigorous upper branches (81–91%). In inoculation experiments with dormant cuttings, no canker developed in those with their basal ends in water; among those kept dry, canker developed more rapidly in the laboratory than in the open. The determination of bark moisture during dormancy may prove a simpler method of estimating tree or stand vulnerability to canker than studies of soil and climatic factors.

2013. FRENCH, D. W., and OSHIMA, N. **Host bark characteristics and infection by *Hypoxylon pruinatum* (Klot.) Cke.** *For. Sci.* 5 (3), 1959 (255–8). 1 ref.

The thin outer layer of bark (phellem) from *Populus tremuloides* increases the % germination of ascospores of *H. pruinatum*, whereas the green layer (cortex and part of the secondary phloem) immediately beneath the outer layer almost completely inhibits germination. This suggests that spore germination, as a prerequisite to invasion of the host by the pathogen, must occur where the green layer is lacking, or possibly where the outer layer covers it. In many branch axils, where the bark of the branch and that of the main stem converge, the green layer is lacking and the phellem is folded over the inner bark layers. It is possible that the fungus is able to enter the host at this point where the conditions are more favourable for the germination of ascospores. [Cf. *F.A.* 13 No. 60.] *From authors' summary.*

2014. CZABATOR, F. J., and ENGHARDT, H. **Nursery-infected seedlings develop fusiform rust cankers after outplanting.** *Tree Plant. Notes* No. 37, 1959 (23–5). 8 refs.

A careful study showed that much *Cronartium fusiforme* canker in plantations of *Pinus taeda* was due to latent infection in nursery stock that was not visible at the time of grading. It is recommended that nursery beds should be sprayed twice a week till germination is complete, and then at weekly intervals till mid-June using ferbam, ziram, or zineb at 2 lb./75 gal. water. Spraying should be more frequent in rainy weather or periods of high relative humidity and high temperature.

Foliage Diseases

2015. CHILDS, T. W. ***Elytroderma* needle blight of Ponderosa Pine**. *For. Pest Leafl. U.S. For. Serv.* No. 42, 1959. pp. 4. 4 refs.

A discussion of the disease, describing the fungus *Elytroderma deformans* and the injury caused, its effect on the trees and relation to environment, and control, chiefly by sanitation fellings, as direct methods such as spraying are not practicable at present [cf. *F.A.* 16 No. 3149].

2016. FISCHER, H. Betrachtungen zur Entwicklung der Schütteerkrankung der Kiefernkulturen im Klever Reichswald. **[Observations on the development of *Lophodermium pinastri* in Pine plantations in the Kleve State Forest.]** *Forst- u. Holzw.* 14 (18), 1959 (402–4). 7 refs. [G.g.]

An extension of Menzel's report [see *F.A.* 21 No. 651], paying particular attention to climatic influences on the biological development of the disease, and to control measures in 1958 and 1959.

2017. RIMKUS, A. K usoveršenstvovaniju mer bor'by s bolezn'ju šjutte. **[Improved methods of controlling *Lophodermium pinastri*.]** *Doklady Naučnoj Konferencii po Zaščite Rastenij, Vilnius 1958*, 1959 (329–32). [Russ.]

Reports on the rates of ascospore dispersal in relation to temperature and precipitation in 1951–52 and 1954–56. From this it appears that generally in Lithuania the best time to spray is from early July to Oct., at 3-week intervals. If July is cold or dry, spraying can be postponed till the end of July, and if September is dry, spraying can finish at the end of August or in early September. The best spray is Bordeaux mixture.

2018. SCHÖNHAR, S. Eine Nadelerkrankung der Fichte. **[A needle disease of Spruce.]** *Allg. Forstzeitschr.* 14 (49), 1959 (857). 4 refs. [G.]

Describes a disease that has been increasingly observed since 1956 in S. Baden plantations. It starts on the shoots of the lower branches and finally attacks the terminal shoots, causing discoloration and death of the needles. As the mycelium of a fungus identified as *Rhizosphaera kalkhoffii* has been found in all needles showing the first symptoms, a causal connexion is assumed. The disease causes loss of increment and, if prolonged, may be fatal. Trees appear to vary greatly in susceptibility, without a marked difference between dominant and suppressed individuals. [Cf. *F.A.* 19 No. 749.]

2019. ITO, K., and KOBAYASHI, T. **Studies on some anthracnoses of woody plants—V. Anthracnose fungi of Black Locust**. *Bull. For. Exp. Sta., Meguro, Tokyo* No. 108, 1958 (1–29 + 6 plates). 12 refs. [E.e.jap.]

[Cf. *F.A.* 19 No. 584.] *Guignardia robiniae* sp. nov. is described and identified as the ascigerous form of *Colletotrichum revolutum*. Other *Colletotrichum* spp. are discussed.

2020. SCHREINER, E. J. **Rating Poplars for *Melampsora* leaf rust infection**. *For. Res. Note Ntheast. For. Exp. Sta.* No. 90, 1959. pp. 3.

Describes a system successfully used by the author to estimate the pathological effect of the rust on hybrid Poplars, rating them on a numerical scale from 1 to 100 according to degree of infection of leaves and % of leaves affected.

2021. BOYER, M. G. **Ascospore discharge in *Mycosphaerella populorum*** Thompson. *Bi-m. Progr.Rep. Div. For. Biol. Dep. Agric. Can.* 15 (4), 1959 (1–2).

In an experiment to ascertain the feasibility of artificially induced maturation of perithecia, it was shown that the perithecia of *M. populorum* can be brought to maturation under controlled laboratory conditions, a resting period of $\ngtr 45$ days at $< 0°$ C. apparently being necessary. Thereafter a period of relatively high temperatures (22–26°) stimulated spore discharge while lower temperatures (7–13°) inhibited it.

2022. ŠUTIĆ, D., and TEŠIĆ, Z. Jedna nova bakterioza bresta i zazivač *Pseudomonas ulmi*, n.sp. **[A new bacterial disease of Elm (*Pseudomonas ulmi*, sp. nov.).]** *Zašt. Bilja* 45, 1958 (13–25 + 2 plates). 18 refs. [Serb.f.] I.M.I.

Describes a new bacterial disease first observed in Jugoslavia after World War II, and causing leaf spot and necrosis of Elm.

45. Damage by Animals

451. Mammals

See also Nos. 1390, 1403–4, 1615, 1637, 1644, 1745, 1812, 2405.

2023. PUDDEN, H. H. C. **Rodent damage to exotic softwood species in Kenya**. *Tech. Note For. Dep. Kenya* No. 63, 1959. pp. 3.

The most serious damage is to *Cupressus lusitanica* and *C. benthamii* during the stage before the outer layer of the bark becomes corky (4–5 years at the base of the tree, but damage is sometimes caused later, at heights of 9 ft.). Species of rodents concerned are listed and control measures (preservation of birds of prey, early pruning, poisons, etc.) are discussed.

2024. KUWAHATA, T., and KATO, R. **[Studies on the habitat and the dispersal of field mice (2). Population density of field mice in relation to the forest plant vegetation.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 108, 1958 (31–46). 23 refs. [Jap.jap.e.e.]

The study showed that *Clethrionomys rufocanus bedfordiae* is dominant in the *Fraxinus*-type forest, and *Apodemus* spp. dominant in the coniferous plantations and forest of the area investigated. The seasonal fluctuations of populations of the two genera are different, and therefore different control methods are necessary in the different forest types.

2025. BÜTTNER, H., and WELLENSTEIN, G. Akute Mäusegefahr—Zweckmässige Bekämpfung. **[Acute danger from voles and their efficient control.]** *Allg. Forstzeitschr.* 14 (45), 1959 (791). [G.]

Suggestions for dealing with the vole problem, made serious through the dry summer of 1959, include, against *Microtus agrestis*, spraying by helicopter with toxaphene (4 kg. in 50–60 litres water/ha.), a method by which ca. 23 ha. of plantations near Freiburg i. Br. were treated successfully in 30 min. (flying costs DM.20/ha.), and against *Arvicola amphibius*, soil injections with 1% toxaphene at ca. 50-cm. intervals close to the plants requiring protection.

2026. Magnani, G. Danni prodotti da roditori su pioppo e ontano. Studio sulle cicatrizzazione e sui tessuti cicatriziali. **[Damage by rodents on Poplar and Alder. Study of callus formation and callus tissues.]** *Pubbl. Cent. Sper. Agric. For., Roma* 2, 1959 (119–35 + 3 plates). 3 refs. [It.it.e.*e*.]

A study was made of damage by the dormouse *Glis glis* on Poplar (*Populus* × *canadensis*) and Alder (*Alnus glutinosa*). Damage to Poplar was most severe in a nursery and a young, crowded plantation near an area of natural woodland. In the plantation the trees were so close that the animal, which is very agile, could easily jump from one tree-top to another. Damage was much less in more widely spaced plantations and in those separated from the woodland by a strip of bare ground. Damage to Alder was much less severe, and different in character from that to Poplar. Because of its rapid growth, Poplar shows more active, and sometimes very rapid, healing. Its callus tissues were found to be anomalous in anatomy and arrangement, but showed signs of becoming regular as soon as the wound was about to close. In Alder, probably because of its slower growth, there was less new tissue formed, and it was more regular.

2027. Acatay, A. Sedir kozalaklarinda sincap tahribatı. **[Damage to *Cedrus libani* cones by squirrels.]** *Istanbul Üniv. Orm. Fak. Derg.* 8*A* (2), 1958 (1–4). [Turk.g.]

An illustrated account of damage by *Sciurus vulgaris* to cones of native *C. libani* in the Taurus mountains of Turkey.

2028. Szczerbiński, W. Spałowanie świerka i sosny przez grubą zwierzynę łowną. **[Barking of Spruce and Pine by game [deer].]** *Sylwan* 103 (8), 1959 (31–40). 3 refs. [Pol.russ.e.]

[Cf. *F.A.* 21 No. 676.] Investigations showed that barking reduced the value of a tree by 2–27% (mean 12%). Some data are given on the numbers and dimensions of barking scars, and different types of defects caused by barking are discussed.

2029. Voedselonderzoek grofwild. **[Investigation on the food of game.]** *Meded. Inst. Toegep. Biol. Onderz. Nat.* No. 44, 1959 (33, 37). [Du.e.]

From stomach analyses of 285 red deer it appears that young Pines are barked when more suitable food is lacking (i.e. during the winter months).

2030. Grisez, T. J. **The Hickory Run deer exclosure.** *For. Res. Note Ntheast. For. Exp. Sta.* No. 87, 1959. pp. 4.

In a study of a fenced and an adjoining unfenced plot in Pennsylvania, planted with Pines in 1950, numbers and heights of both planted and naturally grown trees were very much greater where deer browsing was excluded. The mean heights of *Pinus resinosa* at time of writing were 11 and 2·5 ft. respectively.

2031. Ueckermann, E. Einzelschutzmassnahmen zur Verhütung von Wildschäden im Walde. **[Means for protecting individual trees against game damage.]** *Allg. Forstzeitschr.* 14 (48), 1959 (842–4). [G.]

Lists chemical repellents and mechanical devices of German manufacture for use, severally or in combination, to protect individual trees against injury from deer by browsing, rubbing or barking.

2032. Rieben, E. La protection des forêts contre les dommages provoqués par le gibier. **[The protection of forest against deer damage.]** *Forêt, Neuchâtel* 13 (1), 1959 (10–2). [F.]

Waldine, a non-toxic Swiss repellent [composition not specified], has been successfully tried on a large scale in Switzerland, particularly on Larch. Waldine I is used against browsing, and Waldine II against rubbing by roe deer. It is claimed that one brush application protects shoots for a year, and that 1 kg. suffices for ca. 200 plants.

2033. Kan illeluktende tjærestoffer holde elgen borte fra ungskogen? **[Can unpleasant-smelling tar substances keep elk away from young forests?]** *Norsk Skogbr.* 5 (22), 1959 (616–7). [Nor.]

An Austrian preparation, Silvacol-Konifix A, produced by Agro Pflanzenschutz Gesellschaft, Wels, gave complete protection to 40 dekares of young Pine, when applied to the edge plants only. Neighbouring untreated areas were heavily damaged.

2034. Prignon, M. Clôtures et transformation des pessières: vers une solution plus économique. **[Fencing and the conversion of Spruce stands: towards a more economic solution.]** *Bull. Soc. For. Belg.* 66 (10), 1959 (440–5); 67 (1), 1960 (1–6 + 1 photo). [F.]

Propounds a method of determining the most economic way of fencing group regeneration of exotic hardwoods in Spruce stands, by using a 'coefficient of investment' (c.i.) based on the ratio of perimeter to surface of the area to be fenced. The smaller the area to be fenced, the greater is the advantage of the circle over the square. The coefficient decreases much more sharply in passing from 2 to 10 ares than in passing from 20 ares to 1 ha., though in each case the area is multiplied by 5. If a maximum value of 0·11 be fixed for c.i., the minimum economic size of groups is 10 ares for circular and 14 ares for square plots. Types of wire fencing, methods of fixing it, and costs, are also discussed.

2035. Pfuhl, A. Das "Hängegatter Weilmünster". **[The "Weilmünster" hanging fence.]** *Allg. Forstzeitschr.* 14 (49), 1959 (860–2). [G.g.]

Describes a wire-mesh fence suspended from a strong taut wire fastened by metal bands to trees left standing when the area is felled and pegged at the bottom. The bands are fitted with springs to allow for diameter growth and are said not to injure the trees. The saving in materials and labour compared to usual fencing methods (some comparative data given) is claimed to be considerable.

2036. **Electric fencing against elephants and buffalo.** *Extr.* from *Rep. For. Dep. Uganda 1957/58*, 1959 (23 + 1 photo).

[Cf. *F.A.* 15 No. 1558.] Three experimental electric fences were established and maintained, using a great variety of batteries, insulators, wire and environment. So far, costs have averaged £40/mile for establishment and £5/mile/month for maintenance. This high figure was due to the frequency of short-circuits caused by cobwebs, falling branches, climbers and luxuriant vegetation, and the frequency in some areas of breaks caused by animals. Buffalo were generally, but elephant rarely, defeated by the fence. In the only area where elephant were successfully excluded, the effect on sapling regeneration was phenomenal, giving some of the most rapid height growth ever seen in Uganda natural forest.

452. Birds

2037. SLÁDEK, J. Poznámky k ekológii hlucháňa obyčajného (*Tetrao urogallus* L.). **[Notes on the ecology of *T. urogallus* [in Slovakia].]** *Lesn. Čas.* 5 (5), 1959 (341–55). 42 refs. [Slovak.slovak. russ.g.]

Contains, *inter alia*, an analysis of the contents of 9 crops and 19 stomachs taken between 1 April and 15 May in 1953–58. Beech buds or Spruce shoots were found in all cases but in some crops only flower buds were found, indicating selective feeding.

453. Insects

See also Nos. 1912, 1914, 2209.

2038. STEINHAUS, E. A., and SMITH, R. F. [Editors]. **Annual review of entomology. Vol. 4.** Annual Reviews Inc., Palo Alto, Calif. 1959. pp. 467. Many refs. Price $7.50 (60*s*.).

Includes literature reviews on the following subjects: Insect blood cells (*V. B. Wigglesworth*); Culture of insect tissues (*M. F. Day* and *T. D. C. Grace*); Pheromones (ectohormones) in insects (*P. Karlson* and *A. Butenandt*); Insect pigments (*R. I. T. Cromartie*); Taxonomic problems with closely related species (*W. J. Brown*); Ecology of Cerambycidae (*E. G. Linsley*); Biology of aphids (*J. S. Kennedy* and *H. L. G. Stroyan*); The biology of parasitic Hymenoptera (*R. L. Dutt*); Bioclimatic studies with insects (*P. S. Messenger*); Ethological studies of insect behaviour (*G. P. Baerends*); Experimental host-parasite populations (*T. Burnett*); Biological control of weeds with insects (*C. B. Huffaker*); Microbial control of insect pests (*Y. Tanada*); On the mode of action of insecticides (*F. P. W. Winteringham* and *S. E. Lewis*); Biological assay of insecticide residues (*S. Nagasawa*); Deciduous fruit insects and their control (*M. M. Barnes*); Seed treatment as a method of insect control (*W. H. Lange, Jr.*).

2039. BHASIN, G. D., ROONWAL, M. L., and SINGH, B. **A list of insect pests of forest plants in India and the adjacent countries (arranged alphabetically according to the plant genera and species, for the use of forest officers). Part 3. List of insect pests of plant genera 'A' (appendix only), 'B' (*Baccaurea* to *Buxus*) and 'C' (in part) (*Cadaba* to *Citrus*).** *Indian For. Bull.* (*n.s.*) No. 171 (2), 1958. pp. 126. Price *Rs*.4.50 or 7*s*. [Cf. *F.A.* 16 No. 4281.]

2040. CAMPBELL, K. G. **The importance of research into forest insect problems in New South Wales.** *Aust. For.* 23 (1), 1959 (19–23). 3 refs.

Reviews the principal pests and discusses the dangers inherent in the present policy of converting indigenous mixed stands to pure or few-species stands, and in the planting of large pure areas of exotic conifers.

2041. RAWLINGS, G. B. **Problems of forest entomology in exotic forests in New Zealand.** *Repr.* from *Proc. 10th Int. Congr. Ent., Montreal* 4, 1956 (241–6). 4 refs. (*N.Z. For. Res. Note* No. 22, 1959.)

Discusses the range and requirements of exotic forests in New Zealand (largely *Pinus radiata*, but also Douglas Fir, European Larch, Corsican and Southern Pines), and examines the climatic, edaphic, physiographic and biotic factors affecting their successful establishment. Problems of insect control are also dealt with, and brief mention is made of ecological and taxonomic problems.

2042. BENNETT, W. H., CHELLMAN, C. W., and HOLT, W. R. **Insect enemies of Southern Pines.** *Occ. Pap. Sth. For. Exp. Sta.* No. 164, 1958. pp. 35.

Summarizes information on identification, habits and control of the more common pests (including, briefly, Tetranychidae).

2043. OSSOWSKI, L. L. J., and WORTMANN, G. B. **An annotated list of Wattle insects and spiders of Southern Africa.** *Extr.* from *Rep. Wattle Res. Inst. S. Afr. 1958/59*, 1959 (32–49 + 3 plates).

Gives an account of insects and spiders observed or collected during the period 1949–59.

2044. WATERS, W. E., and HENSON, W. R. **Some sampling attributes of the negative bionomial distribution with special reference to forest insects.** *For. Sci.* 5 (4), 1959 (397–412). 36 refs.

Analyses the frequency distributions of *Eriophyes* sp. on 5 different sampling units of *Populus tremuloides*, and of *Rhyacionia frustrana* on 3 different sampling units of *Pinus taeda*, and suggests the negative binomial series as a standard for evaluating observed spatial distributions of forest insects. For proper evaluation of the non-random distribution of forest insects in natural populations, an understanding of the effect of size and form of sampling unit on the analysis and interpretation of frequency distribution data is of basic importance in solving the problem caused by confounding biologically significant factors and strictly artificial components. The difference between *true* and *apparent* contagion is clarified, and it is suggested that, in ecological studies of insects in which the factor of aggregration is involved, data should be recorded and analysed on the basis of at least 2 natural spatial sampling units, whose area or volume relationships should be known. *From authors' summary.*

2045. HENSON, W. R., and STARK, R. W. **The description of insect numbers**. *J. econ. Ent.* 52 (5), 1959 (847–50). 10 refs.

In economic entomology, particularly forest entomology, the description of insect numbers in absolute terms may be misleading. The effect of an individual on its host varies greatly between species, and this gives rise to unwarranted comparisons within current systems. The insect/host relationship between *Recurvaria starki* (*R. milleri*) and *Pinus contorta* is reviewed [cf. *F.A.* 19 No. 4497] and used as an example in the erection of a three-class (tolerable, critical, intolerable) system for the description of insect numbers, based on the effect of the insect on its host. *From authors' summary.*

2046. JOLY, R. Influence des défoliateurs forestiers sur l'accroissement. **[The influence of forest defoliators on increment.]** *Rev. for. franç.* 11 (11), 1959 (775–84). [F.]

Describes an experiment involving the artificial defoliation of a plot of rooted cuttings of *Populus × robusta* to simulate defoliation by insects: (*a*) 10 trees had all leaves removed in June 1956 and June 1957, (*b*) 10 others had one out of two leaves removed on the same dates, and (*c*) 10 controls were left intact. At the end of 1958 mean height of (*a*) was 3129 mm., (*b*) 3760 mm., and (*c*) 3714 mm.; mean radius was respectively 15·69, 21·95, and 23·69 mm., and mean volume 750·85, 1795·26, and 2064·84 c.c. The loss of increment over the 3 years, with reference to the controls, averaged 40% per annum for complete and 3·7% for semi-defoliation.

2047. MIKENAJTE-GAJDENE, E. Vrediteli semjan sosny v Litve. **[Pests of Pine seed in Lithuania.]** *Doklady Naučnoj Konferencii po zaščite Rastenij, Vilnius 1958*, 1959 (147–9). [Russ.]

Investigations showed that *Pissodes validirostris*, *Evetria retiferana* and, to a lesser extent, *Dioryctria abietella* were the most important pests. They were observed most frequently in the *Pinetum callunosum*, *P. cladinosum*, *P. callunoso-cladinosum* and *P. piceetum vacciniosum*, and less frequently and with less intensity in the *P. myrtillosum*. No damage was ever noted in the *P. piceetum sphagnosum*. Some data on outbreaks, damage and natural control are given.

2048. VAJNŠTEJN, B. A., and OSTROVSKAJA, E. N. Vidovoj sostav obitajuščih v počve vreditelej lesopitomnikov Ukrainy. **[The soil-inhabiting insect pests of forest nurseries in the Ukraine.]** *Éntomologičeskoe Obozrenie, Moskva* 38 (2), 1959 (341–7). 12 refs. [Russ.russ.e.] O.H.

Lists species found in 6 nurseries. Most were polyphagous, and the species composition was very constant in different nurseries sited on similar soils, variations for the individual seedling species affected being insignificant. Planned insect control is thus considerably simplified, since the data obtained for one nursery are applicable to others, within any climatic zone.

Insects: Natural and Biological Control

See also Nos. 2038, 2070, 2072–5, 2080, 2084, 2090, 2097, 2100, 2103–5, 2136–9.

2049. BUTOVITSCH, V. Nyare rön inom den biologiska bekämpningen av skadeinsekter i skogen. **[Recent advances in biological control of forest insects.]** *Svenska SkogsvFören. Tidskr.* 57 (3), 1959 (357–66). [Sw.]

Briefly reviews (without literature references) recent work on parasites, predators, microorganisms, fungi and viruses, including Eastern European research on mixtures of fungus spores with insecticides, sublethal doses of insecticides to cause outbreaks of latent viroses, etc.

2050. RUBCOV, I. A. Biologičeskij metod bor′by s vrednymi nasekomymi. **[Biological control of insect pests.]** *Izv. Akad. Nauk SSSR* (*Ser. biol.*) 1959 (4), (558–76). 47 refs. [Russ.russ.e.] A.P.B.

A review of the subject based on a wide scatter of literature.

2051. BENNETT, F. D., and HUGHES, I. W. **Biological control of insect pests in Bermuda**. *Bull. ent. Res.* 50 (3), 1959 (423–36). 19 refs.

Lists the natural enemies of insect pests that have been introduced into the island and the present position of those that have become established, and includes an account of the control project for *Carulaspis minima* and *Lepidosaphes newsteadi* on *Juniperus bermudiana* organized by the Commonwealth Institute of Biological Control [cf. *F.A.* 16 No. 1972]. Contrary to earlier fears, a few Cedars have shown resistance and plants have been raised from their seed. Natural seedlings are also springing up. To what extent the project has contributed to this survival cannot be ascertained, but a recent survey indicated that parasitization of *C. minima* was low and little evidence existed of feeding by coccinellids.

2052. LYSENKO, O. **Report on diagnosis of bacteria isolated from insects (1954–1958)**. *Entomophaga, Paris* 4 (1), 1959 (15–22). 17 refs. [E.f.] O.H.

A list with particular reference to harmful insects found diseased or recently dead in laboratory cultures or in the field, including *Bupalus piniarius*, *Cacoecia crataegana*, *C. murinana*, *Euproctis chrysorrhoea*, *Hyphantria cunea*, *Ips curvidens*, *Lymantria dispar*, *Saperda carcharias* and *Xyloterus lineatus*.

2053. KOYAMA, R. **[Studies on the epizootic diseases of forest insects in Japan. (I). List of pathogens.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 112, 1959 (23–31). 8 refs. [Jap.e.*e*.]

Gives tabulated data on the pathogens (3 bacilli, 21 fungi, 23 viruses and 1 protozoon) causing epizootic diseases of 46 economically important species of forest insect pest.

2054. LANGE, R. Experimentelle Untersuchungen über den Nestbau der Waldameisen. Nesthügel und Volkstärke. **[Experiments on the nest building of forest ants. The relations of nest and population sizes.]** *Entomophaga, Paris* 4 (1), 1959 (47–55). 12 refs. [G.g.f.e.] O.H.

From laboratory studies indicating that height and size of domes built by *Formica rufa* or *F. polyctena* depended on the intensity of radiated heat from above, it is suggested that they depend as much on climatic factors as on population size, and that rapid growth of wire-protected nests may also be partly caused by changed heat conditions.

2055. LAVROV, L. S. Letučie myši—druz'ja lesa. **[Bats are useful in the forest.]** *Lesn. Hoz.* 11 (7), 1958 (45–6). [Russ.]

Discusses briefly the usefulness of bats in helping to control insect pests, and ways of encouraging them, describing five suitable designs of artificial nesting box, and recommending 10–15 boxes per sq. km. of forest.

2056. PETROV, P., and KEREMIDČIEV, M. Roljata na nasekomojadnite ptici v uništožavaneto na vrednite nasekomi v dăržavnata gora Palamara. **[The role of insectivorous birds in controlling harmful insects in the Palamara State Forest.]** *Gorsko Stopanstvo* 14 (5), 1958 (26–32). [Bulg.]

Gives data on the proportions of insects present (*Lymantria dispar* predominating), and the results of stomach analyses of some 15 spp. of birds. The latter were found to play a significant part in the control of insect pests.

Insects: Chemical Control (General)

See also Nos. 1909, 2038, 2065, 2067, 2076, 2082–3, 2091, 2094, 2100–1, 2103, 2112, 2116, 2126, 2128–9, 2131.

2057. STEINER, R., and GRUCH, W. Zur Toxikologie der Insektizide. Literaturübersicht. I. Teil: Dien-Gruppe. **[The toxicology of insecticides: a review of the literature. Part I. The dienes.]** *Mitt. Biol. Bundesanst. Land- u. Forstw., Berl.* No. 95, 1959. pp. 118. 14 pp. of refs. [G.]

Covers international literature on aldrin, dieldrin, endrin, isodrin, chlordane, heptachlor and hexachlorcyclopentadiene, discussing, for each, names and chemical data, uses, toxicity for mammals, birds, fishes etc., pharmacology and biochemistry, accumulation and secretion, pathology (animal and human), countermeasures, residues, tolerance levels and "close seasons" for treatment, and taste.

2058. PARAMONOV, A. JA. Aviacija v bor'be s lesnymi vrediteljami v SSSR. **[Aerial control of forest pests in the U.S.S.R.]** *Issledovanija i Materialy, Institut po Izučeniju SSSR, München* (*Ser.* 1) No. 49, 1959. pp. 75. 129 refs. [Russ.e.] F.C.A.H.

Reviews, on the basis of published Soviet literature, the history of aerial control of forest insect pests in the U.S.S.R. from 1926 to the present. The main insects against which control is practised (mainly defoliators, but also seed and root pests), the chemicals used (mainly DDT and BHC), and also attempts to assist biological control (by spraying virus suspensions, etc.) are discussed, and techniques and results compared with those elsewhere in the world. The question of forecasting places where primary and secondary infestations will occur is discussed in the light of the Soviet theory that the spread of infestation depends mainly on the factors which weaken stands physiologically. Critical numbers of pests, and economic considerations determining the necessity of control are described. The nature of the qualifications required by specialists in forest protection in the U.S.S.R. is also outlined.

2059. JANNONE, G. **Pest control by aviation in Italy.** *Agricultural Aviation, The Hague* 1 (4), 1959 (94–7). 9 refs. [E.] O.R.E.

A brief review, including results of aerial control of *Lymantria dispar* and *Malacosoma neustria* on *Quercus suber*, *Melolontha melolontha* on Poplars, etc.

2060. GÄBLER, H. Perspektiven des Einsatzes von Hubschraubern in der Forstwirtschaft. **[Possibilities for helicopters in forestry.]** *Forst u. Jagd* 9 (11), 1959 (512–4). 15 refs. [G.]

Discusses the merits of helicopters for aerial spraying, chiefly on the basis of W. German experience [cf. *F.A.* 19 No. 672]. They are thought to be the only choice for mountainous country, generally better than aeroplanes in hill country, but less suitable for large level tracts.

2061. GYÖRFI, J. Erdöszelek HCH porozásának hatása a rovarokra. **[The effect of dusting with BHC on forest insects.]** *Erdö* 8 (5), 1959 (190–3 + smries. in suppl.). [Hu.russ.g.]

Describes studies made from 1954 to 1957 on forest insects in the outskirts of a forest dusted with BHC for cockchafer control. Results indicated that daily treatment had no significant effect on useful parasites, since those killed were replaced each day by the immigration of others from untreated areas. The author concludes that an upset of the biological balance need not therefore be feared.

2062. Kleinere Beobachtungen zur Einwirkung von Insektiziden auf die Kronenfauna von Fichten und Tannen. **[Notes on the effect of insecticides on the crown fauna of Spruce and Silver Fir.]** *Allg. Forstztg.* 70 (19/20), 1959: *Suppl.* (*Informationsdienst* No. 25) p. 2. [G.]

In successful fogging operations against *Adelges nüsslini* with Silvapur (lindane and chlordane), BHC + DDT, and BHC + phosphoric-acid esters, many other aphids but few other insects were killed (least with Silvapur). Similar results attended successful trials of BHC and malathion-type insecticides against *Pristiphora abietina*. Predators, particularly spiders, were in all cases very tolerant.

2063. MACDONALD, D. R. **Biological assessment of aerial forest spraying against Spruce budworm in New Brunswick. III. Effects on two overwintering parasites.** *Repr.* from *Canad. Ent.* 91 (6), 1959 (330–6). 12 refs.

A study was made of parasitization of Spruce budworm by *Apanteles fumiferanae* and by *Glypta fumiferanae* on unsprayed plots and on plots sprayed with DDT over the years 1952–57, some sprayed every year and others at varying intervals. There was a distinct tendency towards increasing parasitization by *A. fumiferanae* in the year following spraying, compared with an almost equal balance in increasing and decreasing parasitization in the unsprayed plots. With *G. fumiferanae* the trend towards decreasing parasitization was almost identical in sprayed and unsprayed plots. A week after spraying, parasitization by *A. fumiferanae* was much higher (14–37%) than before spraying in the small budworm population surviving on the branches, and lower (2·6–3·9%) in both living and dead larvae collected from trays set under trees to catch budworms affected by the sprays. For *G. fumiferanae* no consistent difference was found between surviving populations and those affected by the sprays. The reasons for this difference in the two parasites are discussed.

2064. KUČAEVA, A. G. Primenenie antibiotikov protiv nasekomyh-vreditelej rastenij. **[The use of antibiotics against insect pests of plants.]** *Vestn. Sel'.hoz. Nauki, Moskva* 4 (7), 1959 (138–40). [Russ.] O.W.

After observing the reaction of shoots of Oak and *Sorbus* sp. to solutions (80–100 p.p.m.) of 34 different antibiotic preparations (of actinomycete, bacterial, fungal, and synthetic origin), tests were made of their efficacy in controlling larvae of *Lymantria dispar* raised under laboratory conditions. Four types of action were noted: (1) no influence; (2) reduction in larval growth; (3) stimulation of larval growth; and (4) heavy larval mortality. The most lethal was Preparation 719 (from *Actinomyces violaceus*) which gave 100% kill in 6 days.

Orthoptera

2065. CAN, E. Zur Kenntnis von *Isophya amplipennis* Br. v. W., *I. pavelii* Br. v. W. und *I. tenuicerca* Rme (Orth. Tettigoniidae), als Schädlinge von Eichenniederwäldern in Südosteuropa. Teil II. **[*I. amplipennis, I. pavelii* and *I. tenuicerca* as pests of Oak coppice in S.E. Europe. Part II.]** *Z. angew. Ent.* 44 (3), 1959 (227–61). 41 refs. [G.g.e.] O.H.

[Cf. *F.A.* 20 No. 4845.] Part II describes development, bionomics, behaviour etc., in the laboratory and in the field, hosts, mortality factors, economic importance and control. Though polyphagous, *I. tenuicerca*, and presumably the other two grasshoppers, prefer *Q. conferta* and avoid *Q. sessiliflora*. Outbreaks appear to be favoured by dry warm springs. In addition to increment losses, severe outbreaks cause dieback and mortality over large areas. Spraying with Agrocide (BHC-type) at ca. 2500 litres/ha. of 0·25 to 0·3% aqueous suspension gave good control. On good sites, conversion to high forest is suggested.

Hemiptera

See also Nos. 2051, 2062.

2066. **Field observations on a severe outbreak of *Tessaratoma javanica* Thunberg, a sporadic pest of Kusum (*Schleichera oleosa*) and preliminary trials on its control.** *Repr.* from *Indian Journal of Entomology, New Delhi* 19 (3), 1957 (214–6). 2 refs. I.I.E.

Sweeping and collecting the clusters of bugs with the help of hand nets, and dropping them into a mixture of 1 oz. kerosene/1 gal. water was by far the most effective method of control.

2067. BIEBERDORF, G. A., and HUNTER, K. **A systemic insecticide on ornamental plants.** *Proc. Okla. Acad. Sci.* 37, 1959 (27–9).

Three different concentrations of Systox applied by three different methods to *Ulmus americana* failed to reduce *Erythroneura dumosa* populations to any significant extent.

2068. DUŠEK, J., and KŘÍSTEK, J. Poznámky k výskytu a bionomii larev pestřenek (Diptera, Syrphidae) v hálkách topolových dutilek. **[The occurrence and bionomy of syrphid larvae in galls of *Pemphigus* spp.]** *Zool. Listy, Brno* 8 (4), 1959 (299–308 + 2 plates). 14 refs. [Cz.g.*g*.] O.R.S.

2069. JOHNSON, N. E. ***Pineus* infestation on true Firs in Western Washington.** *J. econ. Ent.* 52 (5), 1959 (828–9). 7 refs.

A first report of an undescribed aphid (*Pineus* sp.) attacking stems and branches of *Abies amabilis* and *A. grandis*, causing little apparent damage. The differences between *Pineus* sp. and the Balsam woolly aphid are described.

2070. MELVIN, J. C., and PRENTICE, R. M. **A predator of the cottony Maple scale [*Pulvinaria innumerabilis*].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (5), 1959 (2).

Examination of 90 mature scale insects in early July (1959) showed that 82% had been attacked by *Leucopomyia pulvinariae*, the larvae of which had fed heavily on the emerging crawlers beneath the adult scales. Though it is impossible at present to assess the effects of this predation on the scale infestation in the Greater Winnipeg area, the lack of foliage wilting of Manitoba Maple suggests effective control. Population counts are to continue.

Lepidoptera

See also Nos. 2047, 2052, 2056, 2059, 2063–4.

2071. SINADSKIJ, JU. V. Drevotočcy—vrediteli tugajnyh lesov. **[*Cossus* and *Holcocerus* spp.—pests of riparian forests [in Central Asia].]** *Lesn. Hoz.* 11 (8), 1958 (51–3). [Russ.]

Describes briefly *C. cossus*, *H. arenicola* and *H. campicola*, and the damage done by them to *Salix songarica*, *Elaeagnus angustifolia*, *Haloxylon aphyllum*, and *Tamarix* sp.

2072. LEMARIE, J. Příspěvek k poznání cizopasníků makadlovky borové *Exoteleia* (*Heringia*) *dodecella* L. Část II. **[The parasites of *E. dodecella*. II.]** *Zool. Listy, Brno* 8 (4), 1959 (309–14). 12 refs. [Cz.g.] O.R.S.

[Cf. *F.A.* 20 No. 4863.] Ichneumonidae, Braconidae, and Larvaevoridae.

2073. LINDQUIST, O. H., and SIPPELL, W. L. **New distribution records and notes on an Arborvitae leaf-miner [*Argyresthia aureoargentella*] in Ontario.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (4), 1959 (2).

The insect was found on *Thuja occidentalis* in most districts. Four parasites were identified, *Apanteles paralechiae*, *Pentacnemus bucculatricis*, *Pnigalio* sp.? *tischeriae* and *P.* sp.? *kukakensis*.

2074. GIFFORD, D. **Notes on Scottish woodland insects: 1. The small ermine moth, *Yponomeuta evonymella* (L.) (Lepidoptera: Yponomeutidae).** *Scot. For.* 13 (3/4), 1959 (142–3 + 2 photos).

Description, life history, and natural and artificial control of the insect, the web-spinning larvae of which defoliate *Prunus padus*.

2075. DELUCCHI, V. L. ***Lithocolletis messaniella* Zeller (Lep. Gracilariidae). Analysis of some mortality factors with particular reference to its parasite complex.** *Entomophaga, Paris* 3 (3), 1958 (203–70). 52 refs. [E.e.g.] O.H.

Reports on research undertaken for the Entomology Division, D.S.I.R., New Zealand, where *L. messaniella* has become a serious pest [cf. *F.A.* 15 No. 3801], from autumn 1955 to spring 1957, chiefly in S. Switzerland and N. Italy up to the northern limits of *Quercus suber*. *Q. suber* and *Q. ilex* are the chief winter hosts, while *Castanea sativa* and *Q. robur* s.l. and occasionally other Fagaceae are the summer hosts. There are 2 winter and 3–4 summer generations and generally 6 larval stages. Host preference, which varies with climate, and damage are discussed, including the possible reasons for the economic importance of the insect in New Zealand, in contrast to its unimportance in Europe. Climatic factors discussed include rain, hail and wind on deciduous plants in summer, and low winter temperatures, particularly in connexion with the physiological changes in evergreen leaves that lead to a more rapid degeneration of the cells surrounding the mine, and thus to the death of the larva either in the sap- or in the tissue-feeding stage. Migration from deciduous to evergreen hosts in winter is also an important factor limiting population increase. The parasite complex of each generation was studied in detail, particularly as regards interaction. Twenty-one species (1 braconid and 20 chalcids) were bred from *L. messaniella* and two species, *Apanteles circumscriptus* and *Enaysma splendens*, were collected in quantity and dispatched by air to New Zealand for the biological control of the pest.

2076. BELLIS, E. DE. Contributo alla conoscenza della biologia della *Gypsonoma aceriana* Dup. **[Contribution to the knowledge of the biology of *G. aceriana*.]** *Pubbl. Cent. Sper. Agric. For., Roma* 2, 1958 (1959), (3–22 + 9 plates). 14 refs. [It.it.e.*e.*]

Describes the life history of the insect on the basis of observations made at Lazio in 1955–56. Eggs are laid on Poplar leaves in May, and the newly hatched larvae tunnel into the young shoots, and later pupate in the ground. The second generation hibernates in cocoons on the tree. The method of control recommended is to spray the leaves with synthetic organic phosphorus compounds in autumn before the larvae move to the stem for hibernation.

2077. ZAŠEV, B. Smărčovata šišarkova listovrătka. **[*Laspeyresia strobilella*.]** *Gorsko Stopanstvo* 14 (5), 1958 (19–25). [Bulg.]

Morphology, distribution in Bulgaria, damage to Spruce cones, and notes on control.

2078. MILLER, W. E. ***Petrova houseri*, a new pitch-nodule moth from eastern North America.** *Ohio J. Sci.* 59 (4), 1959 (230–2). 4refs. C.G.B.

Presents a description of this moth, which is specific to *Pinus echinata*.

2079. TALERICO, R. L. **How to separate damage by the European Pine shoot moth [*Rhyacionia buoliana*], the Zimmerman Pine moth [*Dioryctria zimmermani*], and the Pitch mass borer [*Parharmonia pini*].** *Tech. Note Lake St. For. Exp. Sta.* No. 571, 1959. pp. 2. 1 ref.

Describes and illustrates typical injuries and presents descriptions of the larvae, with some data on the bionomics of the insects.

2080. MILLER, W. E. **Preliminary study of European Pine shoot moth parasitism in Lower Michigan.** *J. econ. Ent.* 52 (4), 1959 (768–9). 5 refs.

Parasites of *Rhyacionia buoliana* identified were *Trichogramma minutum*, *Hyssopus thymus*, *Itoplectis conquisitor*, *Calliephialtes comstockii*, and *Eurytoma pini*.

2081. MERKER, E., and BÜTTNER, H. Die Wirkung von Mülldünger auf den Befall von Kiefernknospentriebwicklern. **[The effect of fertilizing with household refuse on attack by *Rhyacionia buoliana*.]** *Allg. Forstzeitschr.* 14 (45), 1959 (792). 6 refs. [G.]

In Pine plantations on Zons Heath, which had been planted after fertilizing with 0, 45, 60 or 75 tons/ha. of Düsseldorf town refuse [cf. *F.A.* 20 No. 946], the % of shoots attacked was 90, 82, 69, and 68, and the % of dead larvae in the buds at the end of Feb. and in early March was 5, 20, 32, and 13. The decline in mortality at the highest dosage suggests possible adverse plant-physiological effects through over-doses. [Cf. *F.A.* 18 No. 1851.]

2082. HAYNES, D. L. **Dorsal contact toxicity of six insecticides to wintering larvae of the European Pine shoot moth [*Rhyacionia buoliana*].** *J. econ. Ent.* 52 (4), 1959 (588–90). 4 refs.

No significant mortality was obtained with DDT, chlordane or BHC at any concentration used. Malathion, thimet, and dimethoate were effective at all concentrations used. Failure of DDT to act as a contact insecticide suggests that the excellent control obtained with it in the field is due to the residue acting as a stomach poison.

2083. FLINK, P. R. **Red Pine nursery stock fumigation in Michigan Conservation Department nurseries.** *Tree Plant. Notes* No. 37, 1959 (17–21).

[Cf. *F.A.* 21 No. 712.] *Rhyacionia buoliana* has become one of the most serious plantation pests of *Pinus resinosa* in Michigan. Careful removal of infested plants in the nursery does much to control the pests, but this is expensive and some infested trees are always missed. Fumigation of planting stock with MeBr after it had been lifted from infested beds was found to be very effective, caused no serious damage to the plants, and cost < 4 cents/1000 trees. The process of fumigation of the plants after packing in open-ended bales is described in detail.

2084. MILLER, W. E., and NEISWANDER, R. B. **The Pitch Pine tip moth *Rhyacionia rigidana***

(Fernald) and its occurrence in Ohio (Lepidoptera, Olethreutidae). *Res. Bull. Ohio Agric. Exp. Sta.* No. 840, 1959. pp. 23. 26 refs.

A discussion of taxonomy, distribution, ecology, parasites, etc., based on studies in Ohio [cf. *F.A.* 14 No. 1918], with special reference to points distinguishing the species from *R. frustrana*. *R. rigidana* occurred on trees of all ages, injuring buds and shoots and causing deformation and retarded growth. Six native Pines and four introduced species (including *Pinus sylvestris*) were recorded as hosts.

2085. SCHEFER-IMMEL, V. Einige Bemerkungen zur Biologie des Pappeltriebwicklers, *Semasia aceriana* Dup. **[The biology of *S. aceriana*.]** *Anz. Schädlingsk.* 32 (11), 1959 (166–9). 16 refs. [G.]

Observations in the Rhein-Main district during 1958–59 showed no influence of soils or age class upon susceptibility of Poplars to attack by *Semasia aceriana*, but Black and Lombardy Poplars suffered more severely than *Populus* × *canadensis*. Observations are presented on the biology and life history of the pest.

2086. HOCHMUT, R. Příspěvek k poznání morfologie, bionomie a populační dynamiky obaleče hlohového (*Cacoecia crataegana* Hb.). **[On the morphology, bionomics and population dynamics [in Czechoslovakia] of *C. crataegana*.]** *Práce Výzkum. Úst. Lesn. ČSR* No. 16, 1959 (25–56). 37 refs. [Cz.cz.russ.g.]

The insect has recently become a serious pest of Oak in Czechoslovakia.

2087. WILSON, L. F. **Branch 'tip' sampling for determining abundance of Spruce budworm egg masses.** *J. econ. Ent.* 52 (4), 1959 (618–21). 3 refs.

By separating the tips of the shoots from the rest of the branch and counting egg-masses on them alone, 25–40% of sampling time was saved over other sampling methods. The number of egg masses on the tips must be increased by only 16% to obtain the total number on the branch. Branches of any size and from any level in the crown are within the scope of this technique, but it cannot be used on completely or severely defoliated branches.

2088. SHEPHERD, R. F. **Phytosociological and environmental characteristics of outbreak and non-outbreak areas of the two-year cycle Spruce budworm *Choristoneura fumiferana*.** *Ecology* 40 (4), 1959 (608–20). 23 refs.

The Spruce budworm of the Spruce/Fir forests in the Canadian Rocky Mountains maintains a two-year life cycle, overwintering in the 2nd and 4th instars. The life cycles are largely coordinated into one brood so that most adults are found during the even-numbered years, i.e. 1954, 1956, 1958. While the budworm can usually be found in most of the stands, populations in certain restricted stands are consistently higher, as can easily be recognized by marked defoliation and conspicuous red tops. Outside such areas the budworm may be quite common, and many new shoots may sometimes be defoliated, but there is no extensive defoliation. *From author's summary.*

2089. MOLNAR, A. C., and SILVER, G. T. **Build-up of *Pullularia pullulans* (de Bary) Berkhout within a severe Spruce budworm infestation at Babine Lake, British Columbia.** *For. Chron.* 35 (3), 1959 (227–31). 5 refs.

A report of bud necrosis of White Spruce (*Picea glauca*) within budworm-infested stands was investigated. No significant differences in bud mortality could be determined between infested and non-infested stands, but a nine-fold higher incidence of *P. pullulans* was measured in the infested stands, suggesting a build-up of the fungus as a result of conditions created by the budworm infestation. *From authors' summary.*

2090. CAROLIN, V. M., and COULTER, W. K. **The occurrence of insect parasites of *Choristoneura fumiferana* (Clem.), in Oregon.** *J. econ. Ent.* 52 (4), 1959 (550–5). 13 refs.

To date, 34 species of primary parasites have been recovered from the Spruce budworm in Oregon, of which 15 are considered to be of major importance.

2091. **[Use of systemic insecticides in the study of *Tortrix viridana* larval populations.]** *Extr.* from *Rep. Nat. Conservancy, Lond. 1958/59*, 1959 (53–4).

Some unexpected results were obtained in 1958 in connexion with the Phosdrin injection technique [see *F.A.* 19 No. 2006]. Though large numbers of larvae had been collected under the treated trees, the numbers of pupae in the foliage of treated and untreated trees were about the same. In the following winter, when *Tortrix* eggs were counted on sample twigs of 8 injected and 10 untreated trees, the eggs on the injected trees were found to be twice as numerous as on the untreated trees. No explanation of this difference has yet been found.

2092. EBEL, B. H. **Laboratory rearing of a Pine cone insect, *Dioryctria abietella* (D. & S.).** *J. econ. Ent.* 52 (4), 1959 (561–4). 1 ref.

2093. MALZY, P. Note sur deux Psychidae africains. **[Two African psychids.]** *J. Agric. trop. Bot. appl.* 5 (10), 1958 (668–72). [F.] P.O.

Describes *Manatha microcera*, found only on *Khaya senegalensis*, and *Kotochalia* (*Acanthopsyche*) *junodi*, found on a number of species including *Albizzia lebbek*, *Cassia siamea* and *Mangifera indica*, and discusses their biology and control.

2094. JANCKE, G. D. **The Willow moth a pest of fruit orchards too.** *Fmg. S. Afr.* 35 (7), 1959 (19, 21). E.M.B.

Gonimbrasia tyrrhea, though normally a pest of Poplar and Willow, can increase at an alarming rate and, since it is practically omnivorous, can constitute a serious menace to fruit and other plantation trees. Brief notes are given on the biology of the pest. It is advisable to spray forest-margin trees with Eldrin (2 gal. to 100 gal. water) as soon as larvae are observed. Water furrows between the forest and adjacent orchards can form a natural barrier. Aerial spraying of Poplar and Willow is being tried.

2095. DŽOLOVA, N. G., and PROKOF'EV, M. A. Razmnoženie černo-želtoj vanessy v lesah Burjatskoj

ASSR. **[The spread of *Vanessa xanthomelas* in the forests of the Buryat ASSR.]** *Lesn. Hoz.* 11 (12), 1958 (46). [Russ.]

V. xanthomelas severely defoliated *Salix* spp. in the Buryat Mongol ASSR. The only attempts made at control were near Ulan-Ude, where 2000 people were set to work destroying the pupae. Further outbreaks were feared for 1959.

2096. LONŠČAKOV, S. S., MASLOV, A. D., and MIŠEL′, JU. A. Ispol′zovat′ pihtovye nasaždenija Zapadnoj Sibiri, povreždennye sibirskim šelkoprjadom. **[The utilization of *Abies sibirica* stands in W. Siberia, damaged by *Dendrolimus sibiricus*.]** *Lesn. Hoz.* 11 (11), 1958 (40–2). [Russ.]

From studies in 1955–57 in the Tomsk and Kemerovo regions, W. Siberia, it is concluded that after 90–100% defoliation of Fir by *D. sibiricus*, salvage fellings should be made within 1–2 years, before severe beetle infestation seriously lowers the quality of the wood; with 70–80% defoliation, trees should be felled in 2–3 years. Trees 50–60% defoliated can renew their foliage in 2–3 years, and should be felled only in regions where attack by cerambycids (chiefly *Monochamus* spp.) is severe. Stands with < 40% defoliation require no treatment, as they replace their foliage in 1–2 years.

2097. RYVKIN, B. V. K biologii i hozjajstvennomu značeniju lesnoj trihogrammy *Trichogramma embryophagum* (HTG.) (Hymenoptera, Trichogrammatidae). **[The biology and economic importance of *T. embryophagum*.]** *Èntomologičeskoe Obozrenie, Moskva* 38 (2), 1959 (382–93). 35 refs. [Russ.e.] O.H.

Reviews the literature on *T. embryophagum* and discusses its importance as a polyphagous egg-parasite of *Bupalus piniarius*, *Pannolis flammea*, *Acantholyda nemoralis*, and (mainly) *Dendrolimus pini*. Details are given of breeding experiments with the parasite (notable for its high fertility and prevalence of ♀s), and it is suggested that, in laboratory breeding, the infestation rate per egg of *D. pini* should correspond as closely as possible to the mean natural rate, viz. 33 per egg, since over-infestation results in dwarfing and low fertility of emerging parasites. Efficient results were obtained (data tabulated) from release of the parasite during the initial flight phase and oviposition of *D. pini* in areas of mass occurrence [cf. *F.A.* 19 No. 4572].

2098. **Pine looper moth (*Bupalus piniarius*).** *Leafl. For. Comm., Lond.* No. 32 (rev.) 1959. pp. 9. Price 1*s.* 3*d.* [Cf. *F.A.* 17 No. 628.]

2099. Populatie-onderzoek. **[Population investigation [on *Bupalus piniarius*].]** *Meded. Inst. Toegep. Biol. Onderz. Nat.* No. 44, 1959 (25–6, 36–7). [Du.e.]

Investigations on various factors in the natural control of *B. piniarius* showed that: the chances of ♀s mating appeared to be good, even at very low population densities; no definite data could be obtained in 1958 on the role of the parasite *Carcelia obesa*; larval growth appeared to be inhibited by increasing population density, e.g. two larvae reared together were smaller than individuals reared separately.

2100. GÓRNAŚ, E., and ŚLIWA, E. Uwagi o kierunkach ochrony lasu na tle spostrzeżeń w okresie gradacji poprocha cetyniaka w latach 1956/57. **[Observations on trends in forest protection as observed during the outbreak of *Bupalus piniarius* in 1956–57.]** *Sylwan* 103 (11), 1959 (21–8). 1 ref. [Pol.russ.e.]

Discusses the trend towards using mechanical, chemical and biological methods of control in combination, rather than singly. This combined method of control is sometimes called the 'ecological method'. The campaign against *B. piniarius* in Poland in 1956–57 is discussed as an example of combined chemical and biological control.

2101. IL′INSKIJ, A. I. Dubovaja hohlatka *i* mery bor′by s nej. **[*Notodonta anceps* and its control.]** *Lesn. Hoz.* 11 (10), 1958 (47–8). 1 ref. [Russ.]

Describes the insect, the damage it causes by defoliating Oak, and methods of control. Dusting with 12% BHC (12–15 kg./ha.) or 5·5% DDT (15–20 kg.), and spraying with these chemicals in 4–6% solution of diesel oil (6–10 litres/ha.) have given satisfactory results.

2102. FANKHÄNEL, H. Über den Einfluss von Temperatur- und Luftfeuchtigkeitsstufen auf die Entwicklungsgeschwindigkeit, den Nahrungsverbrauch und die Raupensterblichkeit des Goldafters, *Euproctis chrysorrhoea* L. (Lepidoptera). **[The influence of temperature and relative humidity on the rate of development, food consumption and larval mortality of *E. chrysorrhoea*.]** *Beitr. Ent.* 9 (3/4), 1959 (303–22). 12 refs. [G.g.e.russ.] O.H.

In laboratory experiments at r.h. 75% and constant temperatures, larval development times varied from 22 days at 28° C. to 51 at 17° but were slightly shorter in the open (in Oak stands in the Elbe Valley) for the same mean, but fluctuating, temperatures. Lower r.h. increased larval but decreased pupal development times. High r.h. increased larval mortality. Daily and total food consumption increased with temperature, each larva eating ca. 60–70 sq. cm. of Oak leaves during its life. In 1954, when cool nights retarded flushing and warm days stimulated larval activity, heavy damage to buds was observed.

2103. DOWDEN, P. B., and BLAISDELL, H. L. **Gypsy moth.** *For. Pest Leafl. U.S. For. Serv.* No. 41, 1959. pp. 4. 3 refs.

A description of *Lymantria dispar*, its bionomics, hosts, distribution in the U.S.A., damage done, and biological, silvicultural, and chemical control (a 12% solution of DDT in oil at 1 gal./acre being recommended).

2104. JOLY, R. Adaptation alimentaire de '*Lymantria dispar*' L. et décalage des générations dans l'année. **[Nutritional adaptation of *L. dispar* and staggering of generations throughout the year.]** *Rev. for. franç.* 11 (11), 1959 (769–74). 1 ref. [F.]

Discusses the difficulties of continuous rearing of *L. dispar* in the laboratory (a necessary preliminary to biological control), and describes successful rearing on *Pinus sylvestris* foliage instead of Oak [cf. *F.A.* 17 No. 3043].

2105. HITCHCOCK, S. W. **Number of fall generations of *O[o]encyrtus* [*Schedius*] *kuwanae* (How.) in gipsy moth [*Lymantria dispar*] eggs.** *J. econ. Ent.* 52 (4), 1959 (764–5). 2 refs. [Cf. *F.A.* 13 No. 4039.]

2106. MOUCHA, J. K poznáni vlivu potravy na vývoj bekyně velkohlavé (*Lymantria dispar* L.). **[The influence of food on the development of *L. dispar*.]** *Časopis Československé Společnosti Entomologické, Praha* 54 (1), 1957 (73–80). 30 refs. [Cz.russ.g.] L.S.

Egg production per ♀ and speed of larval development were greatest on *Quercus robur* and least on *Tilia cordata*, with *Salix fragilis* and *Populus nigra* intermediate; both declined from spring to autumn. There were 6 larval stages, except on *S. fragilis*, where there were 7 in spring.

2107. RICHTER, D. Zum Auftreten und zur Überwachung der Nonne in Kiefernbeständen. **[The occurrence of *Lymantria monacha* in Pine stands and methods of forecasting outbreaks.]** *Forst u. Jagd* 9 (10), 1959 (467–70). [G.]

Briefly discusses bionomics, climatic conditions for, and the usual course of, outbreaks in Pine stands, injuries, and methods of timely discovery of critical densities (empirically fixed at ca. 500 moths/ha.). It is suggested that a count of moths found resting on 2 sample trees per ha., carried out at 3-day intervals during the flight period is cheaper and more reliable than the more commonly practised counts of eggs, pupae or exuviae on felled sample trees.

2108. SERAFIMOVSKI, A. Smrdelikov četnik (*Thaumetopoea solitaria* var. *iranica* Bang-Hass.). **[*T. solitaria* var. *iranica*.]** *Godišn. Šum. Inst., Skopje* 2 (1), 1957 (59–86). 8 refs. [Maced.maced. g.*g*.]

A detailed account of the morphology and biology of the variety, which is new for Jugoslavia, is believed to have come from Greece and Bulgaria, and feeds in Jugoslavia exclusively on *Pistacia terebinthus*. [Cf. *F.A.* 17 No. 4195.]

Coleoptera

See also Nos. 1400–1, 1478, 2047, 2052, 2059, 2096, 2132.

2109. BIEBERDORF, G. A., and HUNTER, K. **Protecting trees from borers with aluminium foil wraps.** *Proc. Okla. Acad. Sci.* 37, 1959 (24–6).

Aluminium foil wrapping on 4 different tree species successfully reduced attack by borers so long as the wrapping remained intact and both stem and branches were wrapped.

2110. PILECKIS, S. K voprosu o faune vrednyh vidov žestkokrylyh (Coleoptera) v lesah Litovskoj SSR. **[The harmful Coleoptera in the forests of Lithuania.]** *Doklady Naučnoj Konferencii po Zaščite Rastenij, Vilnius 1958*, 1959 (137–44). 17 refs. [Russ.]

From investigations covering 1952–58, distinguishes 390 harmful species, belonging to 18 families. Of these, 36 species are new records for Lithuania. Pests of Pine and Spruce cones and seeds are discussed especially.

2111. HEDLIN, A. F., and STICKLAND, W. G. **An anobiid, *Ernobius punctulatus* Lec., in cones of Douglas Fir.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (5), 1959 (3). 1 ref.

Ernobius spp. have already been reported in the cones of several tree species [cf. *F.A.* 20 No. 2051]. *E. punctulatus* was observed feeding in mature cones of Douglas Fir at Colwood, B.C. Of 411 cones from the 1958 crop, examined in the spring and summer of 1959, 31% were infested with the insect, 1–24 being found in each cone. Tabulated data on larval population and adult emergence, and details of feeding habits, are given.

2112. LYON, R. L. **Tests with DDT foliar sprays to control the California flatheaded borer [*Melanophila californica*].** *Res. Note Pacif. Sthwest. For. Range Exp. Sta.* No. 152, 1959. pp. 6. 4 refs.

Describes a pilot study with adult beetles put into cages round Ponderosa Pine saplings 1 or 5 weeks after spraying at rates of ¼ to 4 lb. DDT in 1 gal. diesel oil/acre. Results suggest that large doses will kill the beetles, 2 lb. being effective at an observed 5–6 weeks, and 4 lb. at an estimated 6–12. But as even such an uncommonly large dose would not protect for the 3-months' flight period, the method is not considered practical [cf. *F.A.* 20 No. 4916].

2113. TEMPLIN, E. Kontrolle und Bekämpfung des blauen Kiefernprachtkäfers (*Phaenops cyanea* F.) in erkrankten Kiefernbeständen. **[Observation and control of *P. cyanea* in diseased Pine stands.]** *Forst u. Jagd* 9 (11), 1959 (514–6). 1 ref. [G.]

Discusses the susceptibility of stands weakened by frost, smoke, or changes in groundwater level to attacks by *P. cyanea* [cf. *F.A.* 16 No. 3207] and other insects, stressing the need for vigilance and control by felling infected trees, bark burning, etc. Under these unfavourable conditions, *P. cyanea* and also *Exoteleia dodecella* are considered primary pests, attacking apparently healthy trees. *E. dodecella* is particularly injurious to smoke-damaged trees because its destruction of buds further reduces the already sparse foliage.

2114. KURIR, A. Dunkler Zierbock (*Anaglyptus mysticus* L.), ein technischer Zerstörer des Erlenholzes. **[*A. mysticus*, a destructive pest of Alder wood.]** *Repr.* from *Holzforsch. u. Holzverwert., Wien* 11 (1), 1959 (7–11). 89 refs. [G.g.e.]

Discusses, on the basis of an extensive literature, the taxonomy, nomenclature, distribution, habitat etc. of this cerambycid, which attacks living hardwoods and occurs over the whole of Europe (including England). The author found larvae in wooden patterns made of Alder in a factory near Vienna. The wood had apparently been infested before use, i.e. at least 6 years earlier. The larvae were in their last stages of development in July, imagos emerging early in Sept. Severely infested pieces were burnt and others fumigated with CS_2.

2115. Petrova, I. A. K biologii bol′šogo osinovogo usača *Saperda carcharias* L. (Coleoptera, Cerambycidae). **[The biology of *S. carcharias*.]** *Ėntomologičeskoe Obozrenie, Moskva* 38 (1), 1959 (119–28). 11 refs. [Russ.russ.e.] O.H.

Investigations in the Balashov region (Voronezh) [cf. *F.A.* 20 No. 2097] indicated that in that region the life cycle lasted 4 years, and the egg, larval (4 instars) and pupal phases ca. 10, 36 and 2 months respectively. A parasitized larva would prepare a pupal chamber and emergence hole irrespective of the instar reached. Adults were photo- and thermophilous and rather sluggish. *From author's summary.*

2116. Bellis, E. de. Aggiornamenti sulla biologia e la lotta contro la saperda maggiore del pioppo (*Saperda carcharias* L.). **[Recent findings on the biology and control of *S. carcharias* on Poplar.]** *Pubbl. Cent. Sper. Agric. For., Roma* 2, 1959 (137–45 + 3 plates). 13 refs. [It.it.e.*e*.]

[Cf. *F.A.* 20 No. 3481.] It has been shown that the species overwinters in the form of eggs deposited in incisions made by the ♀ in the bark of the host. Control can be effected by spraying or painting the bark with an emulsion of parathion (300 g. active substance/hl. of water) at about the time when the larvae emerge.

2117. Sullivan, C. R. **The effect of light and temperature on the behaviour of adults of the White Pine weevil, *Pissodes strobi* Peck.** *Repr.* from *Canad. Ent.* 91 (4), 1959 (213–32). 10 refs.

Reactions of pre-conditioned adults of *P. strobi* to discrete and diffused light sources were studied in the laboratory, and the effect of temperature on these responses is described and used in the interpretation of adult behaviour in the field. Differences in behaviour patterns in the field are related to micrometeorological aspects of weevil habitat and assessed in terms of their observed responses in the laboratory. Young adults during autumn cannot stand exposure to climates as extreme as those survived by older adults in the following spring, but differences in their behaviour patterns indicate that the former are well adapted to marked seasonal differences in the general climate. *From author's summary.*

2118. Marty, R. J. **Predicting weevil-caused volume loss in White Pine [*Pinus strobus*].** *For. Sci.* 5 (3), 1959 (269–74). 7 refs.

Volume loss attributed to weevil injury (both loss of increment and degrade in logs) was determined for each of 300 White Pine trees. A regression of volume loss on tree size and the number and size of weevil injuries was then calculated. The resulting relationship was: Tree volume loss in bd.ft. = 2·08 × (d.b.h. in inches −8) × (injury summation).

2119. Chararas, C. Relations entre la pression osmotique et le rôle de la plante-hôte à l'égard des Coléoptères Scolytidae. **[Relations between the osmotic pressure of the tree host and [its attraction for] scolytid beetles.]** *C.R. Acad. Sci., Paris* 249 (20), 1959 (2109–11). [F.] O.R.S.

Discusses physiological requirements in trap trees (either girdled standing or freshly felled) to ensure maximum attraction to Scolytidae, and the effect on osmotic pressure of removing the branches of felled trees and of placing them in sun or shade. Presents graphs and tables showing the differences in osmotic pressures and in attack for felled Pine trees with or without the branches removed; e.g. there were 104 individuals of *Blastophagus piniperda* per 4·5 sq. m. on a felled tree with branches intact compared with 1020 on one with branches removed. For felled trees in the sun, insect populations on those with branches removed reached a maximum on the 20th day after felling, declining rapidly thereafter, whereas populations on those with branches intact were very small until the 24th day, increasing steadily thereafter until the 42nd. On trees with branches removed but in the shade, populations reached a maximum on the 24th day and remained large until the 54th. Concludes that if trap trees, selected for existing physiological disequilibrium, are felled, lopped and kept in the shade, 85% of the scolytid population can be attracted to them.

2120. Rodary, P. Extension de l'aire de répartition de certains scolytides. **[Extension of the area of distribution of certain scolytid beetles.]** *Rev. for. franç.* 11 (12), 1959 (848–53). 11 refs. [F.]

Briefly discusses the increase in France of *Ips typographus*, *I. acuminatus* and *Dendroctonus micans* and, in more detail, the occurrence of species new to that country, e.g. *Gnathotrichus materiarius*, *Dryocoetes hectographus* and *Xylosandrus germanus*.

2121. Šlander, J. Prezimovanje lubadarjev v zemlji. **[The overwintering of barkbeetles in the ground.]** *Gozd. Vestn.* 16 (4/5), 1958 (150–8). 6 refs. [Sloven.]

Gives details of the numbers of barkbeetles (*Ips typographus*, *Pityogenes chalcographus*, *Crypturgus cinereus*) found overwintering in the soil on sample plots at three different sites in 1951/52, and gives an example of the use of a formula for determining, from these counts, the number of trap trees/ha. that would be necessary to prevent serious damage.

2122. Merker, E., and Adlung, K. G. Die Änderungen des Temperaturpräferendums der Borkenkäfer im Vor- und Nachwinter. **[Changes of temperature preferences of barkbeetles in early and late winter.]** *Zoologische Jahrbücher (Abteilung für allgemeine Zoologie und Physiologie der Tiere), Jena* 68 (1/2), 1958 (325–34). 8 refs. [G.] O.R.S.

Laboratory experiments with *Ips typographus* showed a preference for increasingly lower temperatures in September to November, and for increasingly higher temperatures in spring or after exposure to a temperature of −1° C. for 4–6 weeks.

2123. Nobuchi, A. **Some species of Scolytidae from Ryukyu Islands.** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 116, 1959 (21–6 + 2 plates). [Jap.E.e.]

Describes three species not previously recorded from the Ryukyu Islands (*Carposinus philippinensis*, *Margadillius corpulentus*, and *Cryphalus abbreviatus*), and two new species, *Ips kuniyoshii* from *Pinus luchuensis*, and *Cryphalus garciniae* from *Garcinia spicata*.

2124. FINNEGAN, R. J., MCPHEE, H. G., and WATSON, W. Y. **An ambrosia beetle, *Corthylus punctatissimus* Zimm., attacking Maple regeneration.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (5), 1959 (2).

Describes the damage caused by adult and immature beetles in *Acer saccharum* regeneration, based on 40 insect collections made (from July 30, 1959) in Lake Simcoe, Lake Huron and Lake Erie districts. Mortality in some infested stands during 1959 was 80% of total regeneration, stems of 3–10 mm. diam. almost invariably succumbing. Evidence of attacks by *C. punctatissimus* was also found on regeneration of *Ostrya virginiana* and *Fraxinus americana*.

2125. ATKINS, M. D. **A study of the flight of the Douglas-Fir beetle, *Dendroctonus pseudotsugae* Hopk. (Coleoptera: Scolytidae). I. Flight preparation and response.** *Repr.* from *Canad. Ent.* 91 (5), 1959 (283–91). 13 refs.

The effect of several factors upon the flight response of *D. pseudotsugae* was studied. Temperature had a marked influence, optimum temperatures for spontaneous flight being between 22 and 32° C. The effects of increased stimulation on flight response revealed individual differences between beetles. Once gallery construction had begun, the ♀s lost their ability or inclination to fly, but some showed a later positive response to flight stimulation after 15 days in the tunnels. The ♂s did not entirely lose their positive response until the galleries were one week old, but were again ready to fly along with the ♀s. The beetles took flight at light intensities ranging from 2 to 500 foot-candles, but the speed at which they reacted increased with the light intensity. *From author's summary.*

2126. RIMES, G. D. **The bark beetle in West Australian Pine forests.** *Repr.* from *Journal of Agriculture of Western Australia, Perth* (*Ser. 3*) 8 (3), 1959. pp. 4. 6 refs.

A brief description of *Ips grandicollis*, first recorded in Australia from S. Australia in 1953 [cf. *F.A.* 16 No. 65], its life history, damage and control. In W. Australia the beetles breed mainly in slash and attack only felled or dying trees, but by introducing a stain fungus and causing desiccation, they materially reduce the value of logs for plywood. Felled trees become attractive after 24 to 48 hours, but can be left in the forest for ca. 2 months if protected. Of numerous sprays tested, lindane, 0·3% as a water emulsion, is recommended as the cheapest. Endrin and thiodan also gave good control.

2127. SCHEDL, K. E. Türkiye' de yeni bir *Phloeosinus*. Scolytoidea'nın morfoloji ve sistematiğine 175 inci ilâve. **[A new *Phloeosinus* sp. from Turkey. 175. On the morphology and systematy of the Scolytoidea.]** *Istanbul Üniv. Orm. Fak. Derg.* 8*A* (2), 1958 (31–4). [Turk.G.]

Describes *Phloeosinus acatayi* sp. nov., found in 1957 in *Cedrus libani* wood near Denizli.

2128. ĖDEL′MAN, N. M., and MALYŠEVA, M. S. K biologii žukov *Scolytus intricatus* Ratz. (Coleoptera, Ipidae) v dubravah Saval′skogo leshoza Voronežskoj Oblasti. **[The biology of *S. intricatus* in the Oak woods of the Savala forest (Voronezh region).]** *Ėntomologičeskoe Obozrenie, Moskva* 38 (2), 1959 (369–81). 40 refs. [Russ.e.] O.H.

An investigation into the extensive killing of Oak by a vascular disease caused by *Ophiostoma* sp. established that, among the wood- and bark-borers occurring in the Savala Forest, only *S. intricatus* is a vector of the disease. Since its larvae play no part in spreading the disease and remain in one tree during the larval phase, the imago was studied. Observations of feeding habits and behaviour indicate that its flight range is $\ngtr$ 100 m., that its activity is limited by temperature and light intensity, and that emerging ♀s need supplementary feeding on slender twigs, attacking healthy, as well as *Ophiostoma*-infected, trees. The use of water solutions and emulsions of DDT and BHC, based mainly on successful results previously obtained in *S. multistriatus* control in the U.S.A. and W. Europe [cf. *F.A.* 16 Nos. 644, 1994], is recommended. The trap-log method, following experiments in which 15-year-old logs 7–10 cm. in diameter, and 4–5 m. long, were placed in 4 plots and found to be effective for *S. intricatus*, is also recommended, and the optimum times for sanitation felling are discussed.

2129. AL-AZAWI, A. F., and NORRIS, D. M., JR. **Experimental prevention of bark beetle transmission of *Ceratocystis ulmi* (Buis.) Moreau with the systemic insecticide Chipman R-6199.** *J. econ. Ent.* 52 (5), 1959 (902–4). 2 refs.

Treatment of *Ulmus americana* with 10, 20 or 30 g./tree of Chipman R-6199 in stem bore-holes was effective in preventing transmission of *C. ulmi* by barkbeetles. The mean length of beetle feeding niches was $\leqslant 1{\cdot}5$ mm. in treated trees, and $\geqslant 3{\cdot}3$ mm. in control trees. On the basis of limited knowledge of niche-length requirements, a reduction of 96·3% in the number of infectable niches resulted from this insecticidal treatment. [Cf. *F.A.* 20 No. 3501.] *From authors' summary.*

2130. CHAPMAN, J. A. **Forced attacks by the ambrosia beetle, *Trypodendron*.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (5), 1959 (3).

In order to study the activity of ambrosia beetles when they have no choice of material, tests were made (1957–59) with several hundred captured beetles confined on various Douglas Fir and Western Hemlock logs by aluminium rings one inch deep and 1½ in. diam., held firmly against the bark and covered with cloth at the open end. As control, several pairs of beetles were confined to autumn- or winter-felled logs (*a*) attacked under natural conditions shortly before the tests; these beetles usually initiated and executed an apparently normal attack. In the forced attacks, started during natural flight and attack periods in April or May, almost 50% of the 70 pairs of beetles confined to spring-felled logs (*b*) ceased excavation at, or before reaching, the sapwood (s.w.) surface, and none penetrated > ⅛ in. into the s.w. In the 1959 tests, successful penetration of (*a*) was achieved by 23 out of 25, and of (*b*) by none out of 50, pairs of beetles, the s.w. in (*b*) apparently having a repellent effect or lacking a stimulus for continued burrowing activity. None of the 40 ♂s confined without ♀s on suitable logs noticeably penetrated bark or s.w.; of a total of 196 ♀s confined singly on logs, 146 excavated galleries and 78 of these laid eggs. From a sample of 100 ♀s from (*a*), 48 were virgin and 52 mated; it was observed that unmated ♀s excavate galleries but do not lay eggs. The tests show conclusively that ♂s are not necessary for gallery excavation, egg-laying and brood care.

Hymenoptera

See also No. 2062.

2131. KUDELA, M. Časové omezení chemických zásahů proti ploskohřbetce smrkové. **[The time limits in chemical control of *Cephaleia abietis*.]** *Sbornik Vědeckých Prací Fakulty Lesnické, České Vysoké Učení Technické, Praha* No. 1, 1958 (123–9). 10 refs. [Cz.russ.g.]

Gives the results of control operations in the Erzgebirge in 1954 and 1956 [cf. *F.A.* 20 No. 818]. Dusting the flying ♀s before the culmination of swarming proved best.

2132. NITTO, M., and AKUI, Y. **[The Spruce web-spinning sawfly (*Cephaleia isshikii* Takeuchi) in the University Forest in Hokkaido.]** *Misc. Inform. Tokyo Univ. For.* No. 12, 1957 (37–67). 5 refs. [Jap.jap.]

A detailed study during June–Aug. 1953 of the latest outbreak of this pest, concentrating on the large areas of *Picea abies* found in this mixed conifer/hardwood forest. The attack was heaviest on the better growth, on S. aspects, and on marginal or open-growing trees, but caused no mortality. The sex ratio was ca. 1/1. Some 10–20% of the larvae were found to be parasitized. *P. glehnii* and *P. jezoensis* were also attacked. Secondary attack by the scolytid *Cladoborus arakii* was also noticed. [Cf. *F.A.* 17 No. 3075.]

2133. NOVAK, K. Příspěvek k bionomii hřebenule borové (*Diprion pini* L.). **[The bionomics of *D. pini*.]** *Časopis Československé Společnosti Entomologické, Praha* 54 (1), 1957 (62–5). 20 refs. [Cz.cz.g.] L.S.

Observations in Pine forests in W. Slovakia indicated that two generations were extremely rare. A few insects emerged in the spring after one winter, and more in August, but most pupae lay over for 2 to 4 years. The % of ♂s was 35–38.

2134. Insektenplagen in bossen. **[Outbreaks of insect pests in forests.]** *Meded. Inst. Toegep. Biol. Onderz. Nat.* No. 44, 1959 (10–4, 36). [Du.e.]

[Cf. *F.A.* 20 No. 4936.] In investigations on the prediction of outbreaks of *Diprion pini*, measurements were made from 1954 to 1958 of: (1) numbers of faeces falling per sq. m./day during the 5th larval stage; (2) coefficients of population increase or decrease calculated from (1); (3) egg and 5th-larval-stage density; (4) mean number of faeces per c.c. for the 3rd, 4th, 5th and 6th larval stages; and (5) dry weight of needles eaten by the different larval stages, and, for stages 4 and 5, the dry weight of needles eaten per unit volume of faeces (g./c.c.). A correlation was found between faeces production per day during the oldest larval stage and the total needle consumption during the whole larval development. With this correlation, a rough knowledge of (2), and knowledge of the total quantity of needles in stands of various ages and qualities, a prediction of the density of the next generation can be made.

2135. CONNOLA, D. P., WATERS, W. E., and NASON, E. R. **A sequential sampling plan for Red-Pine sawfly, *Neodiprion nanulus* Schedl.** *J. econ. Ent.* 52 (4), 1959 (600–2). 4 refs.

A recent outbreak of *N. nanulus* has caused considerable damage to plantations of *Pinus resinosa* in New York State. A study of sampling methods for this pest led to the development of the sequential technique for use in control work. The experimental design, methods, and techniques used in the study are described, and a sequential sampling plan based on egg-infested needles found on 6-in. twig samples is presented. It was found, in testing the plan on field-collected data, that 45% of sampling time would have been saved had the plan been available for use at the time the field counts were made. A test of accuracy of the sequential plan showed that it failed only once in 25 trials to predict accurately the degree of defoliation to be expected at sampled locations. *From authors' summary.*

2136. SMIRNOFF, W. A. **Predators of *Neodiprion swainei* Midd. (Hymenoptera. Tenthredinidae) larval vectors of virus diseases.** *Repr.* from *Canad. Ent.* 91 (4), 1959 (246–8).

Pilophorus uhleri, a hemipterous predator of larvae of *N. swainei*, is a vector of virus and can apparently transmit it to its prey. Wasp predators of virus-infected larvae, when crushed, suspended in distilled water, and fed to *N. swainei* larvae, also induced characteristic virus symptoms after 12 days. In an area where only healthy larvae were present the following experiment was performed. Pieces of fresh meat smeared with a highly concentrated suspension of polyhedra were hung from foliage, and wasps were observed to feed on them. After 1 month several *N. swainei* larvae were found dead of polyhedrosis in the vicinity. These observations show the possibility of using artificial baits for wasps and other predators in the spread of virus diseases. This is believed to be the first record of predatory insects transmitting virus diseases to other insects.

2137. MARTINEAU, R. **On an infestation of the red-headed Jack Pine sawfly, *Neodiprion virginianus* complex in Quebec.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (5), 1959 (1).

The special survey conducted in Quebec in relation to an old established infestation of *Neodiprion swainei* led to the detection of a light infestation of another species of sawfly, *Neodiprion virginianus*, also on Jack Pine. The life cycle of the insect is described. After field observations and egg-counts on 26 colonies (for dates of hatching, eggs/needle, eggs/colony, etc.), observations (1958) were made on some natural control factors, including the degree of larval parasitization found in the laboratory rearing of mature larvae collected in the field. Of the 6 parasite species identified—*Diplostichus hamatus*, *Spathimeigenia* sp., *Lamachus* and *Euceros* spp., *Olesicampe lophyri* and *Perilampus hyalinus*—the first and the last were the most abundant.

2138. HOLLING, C. S. **The components of predation as revealed by a study of small-mammal predation of the European Pine sawfly.** *Repr.* from *Canad. Ent.* 91 (5), 1959 (293–320). 48 refs.

Predation on cocooned *Neodiprion sertifer* by small mammals offers an example of a simple type of predation, where only two variables, prey and predator intensity, have to be considered. The basic components of predation are responses to changes in prey density. The increase in number of prey consumed per predator, as prey density rises, is termed the functional response; and the change in density of predators, as a result of increase in prey density, the numerical response. Three important species (1) *Blarina brevicauda talpoides*, (2) *Sorex cinereus cinereus* [both shrews], and (3) *Peromyscus maniculatus bairdii* [mouse], each showed a functional response, and each curve showed an initial S-shape rise up to a constant maximum consumption. The rate of increase of consumption decreased from (1) to (3), while the upper constant level of consumption decreased from (1) to (3) to (2). The form of the functional-response curves is such that the proportion of prey consumed per predator increases to a peak and then decreases. This peaked curve was further emphasized by the direct numerical response of (2) and (3), for their populations rose initially with increase in prey density up to a maximum that was maintained with further increase in cocoon density; (1), however, showed no numerical response. The increased density of predators resulted from increased breeding and was almost immediate. The two basic components of predation can be affected by a number of subsidiary components: prey characteristics, the density and quality of alternate foods, and characteristics of the predators. It was shown experimentally that these components affected the amount of predation by lowering or raising the functional and numerical responses. The peaked type of predation shown by small mammals can theoretically regulate the number of their prey if predation is high enough to match the effective reproduction by prey at some prey density. Even if this condition does not hold, however, oscillations of prey numbers are damped. Since the functional and numerical responses undoubtedly differ for different species of predator, predation by each is likely to come to a peak at a different prey density. Hence, when a large number of different species of predators are present, the declining phase of predation is displaced to a higher prey density, so that the prey have less chance to escape the regulation exerted by predators. *From author's summary.*

2139. BUCKNER, C. H. **The assessment of Larch sawfly [*Pristiphora erichsonii*] cocoon predation by small mammals.** *Repr.* from *Canad. Ent.* 91 (5), 1959 (275–82). 9 refs.

The following techniques were tested: (1) Cocoon planting: apparently sound cocoons were wired to 3-in. tree tags and buried to a depth of ca. 2 in., leaving ca. 1 in. projecting above ground. These were examined and recorded at intervals. (2) Collection rate: cocoons are collected on an area at specified intervals before and after a period of small mammal predation. (3) Cocoon sampling: this is a modification of (2); predetermined stations are sampled before and after predation. (4) Saturation trapping: the entire small-mammal population is removed from an area and comparisons are made with an area containing the normal mammal population. (5) Mammal exclusion cage technique: known numbers of cocoons are exposed to predation, while controls are excluded from predation by mammal-proof cages. (1), (4) and (5) gave reliable results, (2) proved unreliable, and (3), though probably reliable, may be precluded both by labour shortages and by low populations. The exclusive use of one technique may introduce errors.

2140. LINDQUIST, O. H. **A species of *Pristiphora* on Spruce in Ontario.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (5), 1959 (1–2).

Sawfly larvae were collected in the boreal forest region of Ontario in 1958 and 1959, adults reared from the first year's material being tentatively identified as *Pristiphora* sp. near *lena*. Brief descriptions of it and of *Pikonema alaskensis* (with which it is often confused), are given to assist identification of them and their larvae in the field.

2141. BÜTTNER, H. Über die Auswirkung von Düngemassnahmen auf forstliche Schadinsekten. **[The effect of fertilizer treatments on forest insect pests.]** *Naturwissenschaften* 46 (20), 1959 (587). [G.] O.R.S.

Tabulated data are given for treated and untreated plots already studied [see *F.A.* 19 No. 4578], showing the number of pupae per sq. m., the number of wasps emerging, and the % needle loss on the shoots examined.

Diptera

2142. INOU(Y)E, M. **Gall midges (Itonididae) attacking coniferous trees (1).** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 116, 1959 (1–19 + 6 plates). [E.jap.*jap.*]

A study of *Agevillea manii*, which attacks the needles of *Abies sachalinensis*; and *Etsuhoa okayamana* gen. et sp. nov., *Arceuthomyia nakaharai* sp. nov., and *Rhopalomyia netsukii* sp. nov., all attacking the buds and needles of *Juniperus rigida*.

459. Other Animals

See also Nos. 1715, 2042.

2143. GANAPATI, P. N., and RAO, M. V. L. **Incidence of marine borers in the Mangroves of the Godavari estuary.** *Curr. Sci.* 28 (8), 1959 (332). 2 refs. A.P.B.

A preliminary survey of Mangrove vegetation in the Godavari Estuary near Yanam revealed that both living trees (mainly *Avicennia* spp.) and dead stumps were severely attacked by both molluscan and crustacean borers [cf. *F.A.* 16 No. 2017]. The commonest molluscan borer was *Teredo juttingae*, while *Bankia edmondsoni* was also fairly common. *B. campanellata* and *T. furcillatus* were represented by a few individuals, and 3 individuals of *Martesia striata* were also encountered. A good number of the crustacean borer *Sphaeroma terebrans* were present. Dead stumps were honeycombed, and living, apparently healthy, trees showed severe basal attack 6–8 in. above and below ground level.

2144. GOODEY, J. B., FRANKLIN, M. T., and HOOPER, D. J. **Supplement to the nematode parasites of plants catalogued under their hosts 1955-1958.** Commonwealth Agricultural Bureaux, Farnham Royal, Bucks. 1959. pp. 66. 11 pp. of refs. Price. 7*s*. 6*d*. [Cf. *F.A.* 17 No. 4257.]

2145. FRANKLIN, M. T., and HOOPER, D. J. **Plants recorded as resistant to root-knot nematodes (*Meloidogyne* spp.).** *Technical Communication of the Commonwealth Bureau of Helminthology, St. Albans* No. 31, 1959. pp. 33. 87 refs. Price 7*s*. 6*d*.

Consists of two catalogues: (I) plants resistant to *Meloidogyne* spp., (II) *M*. spp. with resistant species listed under them.

46. Damage by Man

See Nos. 1627–8, 1885.

48. Injuries Due to Unknown or Complex Causes

See also Nos. 1581, 2008.

2146. DENTON, R. E., and LEAPHART, C. D. **Symptoms of abnormal crown deterioration in Western White Pine stands.** *Res. Note Intermt. For. Range Exp. Sta.* No. 69, 1959. pp. 4. 1 ref.

A condition [which is not pole blight] prevalent in 1957 and 1958 in N.E. Washington, N. Idaho and W. Montana, particularly in trees below rotation age, is characterized chiefly by the death of 2-year-old or older needles, dying of branches in the lower parts of the crown, stunted new growth, and necrotic lesions on branches ⩾ 3 years old. Though aphids (*Pineus* sp.) were often found on affected trees, and also various needle-cast fungi, the role, if any, of either in causing the disorder has not been clarified. No fungi have been isolated from the necrotic areas.

2147. BERRY, C. R. **Root characteristics of healthy and needle-blighted Eastern White Pines in West Virginia and Tennessee.** *Abstr.* in *Phytopathology* 49 (9), 1959 (534).

Pinus strobus roots from (*a*) needle-blighted and (*b*) healthy areas were examined. There were more dead tips and dead laterals on roots of (*a*) than of (*b*) trees, and many of the main roots also were dead on (*a*). Ca. 1300 isolations were made from healthy and blighted trees and 27 genera of fungi identified, but none of them was associated consistently with blighted trees and none was a recognized root pathogen.

2148. ZYCHA, H. Stand unserer Kenntnis vom Rindensterben der Buche. **[Our present knowledge of the bark disease of Beech.]** *Allg. Forstzeitschr.* 14 (45), 1959 (785–9). 7 refs. [G.g.]

Further observations of the disease [cf. *F.A.* 14 No. 1390; 16 No. 622] have not elucidated the cause, nor has a means of controlling it been found.

2149. PACHLEWSKI, R., and BOROWSKI, S. Obumieranie młodych lip w Białowieskim Parku Narodowym. **[The dying of young *Tilia cordata* in the Białowieża National Park.]** *Sylwan* 103 (8), 1959 (1–11 + 1 tbl.). 9 refs. [Pol.russ.e.]

Describes the dying of groups of *T. cordata* aged 30–42 years, in all associations in the forest containing specimens of this age group. The cause of the trouble is not known, but it is thought that parasitic fungi may be responsible. Research continues.

2150. BOYCE, J. S., and BAKSHI, B. K. **Dying of Sal [*Shorea robusta*].** *Indian For.* 85 (10), 1959 (585–8 + 2 photos).

Sal is dying in many localities, particularly on poor sites, throughout its range in India. Though no one cause can be ascribed, it is believed that dying is generally due to deteriorating site conditions, probably the most important single factor being reduced soil moisture. A fungus, *Hypoxylon mediterraneum*, is constantly associated with dead and dying Sal. It is believed to be pathogenic to weakened Sal and to hasten their death or prevent recovery. It is thought that site improvement by proper silviculture will restore the health of the stands. *From authors' summary.*

2151. BAKSHI, B. K., and BOYCE, J. S. **Water blister in Teak.** *Indian For.* 85 (10), 1959 (589–91 + 4 photos). 4 refs.

Water blister disease in Teak is noticeable in certain plantations along rivers in Nilambur, Kerala State. It is characterized by profuse exudation of light yellow sap from the stem near ground level. As the sap dries up, it leaves a blackish discoloration on the stem. The cause appears to be physiological. In winter, when trees become leafless, transpiration decreases. Under conditions of high temperature and soil moisture, root pressure builds up, forcing the sap to collect in wood crevices developed as a result of shake, in increasing quantity under pressure, till it finds its release through the thin bark. Though the affected trees are not killed, their wood is damaged, and they should be removed during improvement fellings and thinnings. Teak should not be planted on very moist sites where water blister develops. *From authors' summary.*

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

See also Nos. 1310, 2611.

2152. PRODAN, M. Aus der Holzmesslehre. Kritisches Sammelreferat. **[Forest mensuration: a critical review.]** *Forstarchiv* 30 (10), 1959 (185–97). 410 refs. [G.g.]

[Cf. *F.A.* 18 No. 707.] Selected items from the extensive international literature up to 1958 listed in the bibliography are reviewed under the headings: forest surveys; new mensuration instruments and techniques; studies of stem form and quality rating; measurement of stands; increment determination; and new books.

2153. NYYSSÖNEN, A. **Finnish research in the fields of forest mensuration and management in 1909-1959.** *Acta for. fenn.* No. 70, 1959. pp. 22. Many refs. [E.]

A review under the headings: mapping of forests; methods of forest mensuration; growth and yield studies; national forest inventories; and forest management.

2154. MACKENZIE, A. M. **Short cuts in mensuration.** *Scot. For.* 13 (3/4), 1959 (144–53).

Presents, with examples, sixteen rules and relationships which apply principally to even-aged stands of conifers $\leqslant$ 50 years old in Scotland and N. England, and which may be helpful when speed is more essential than precision in mensuration. The rules cover, e.g. the relation of top height and timber height to mean height; the relation of mean quarter girth b.h. to top height and increment; the derivation of volume from q.g. regardless of tree height; estimation of thinning yield by species and per annum; the estimation of volume production for common conifers by use of constants; etc.

52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

2155. EKLUND, B. Några synpunkter på skogsuppskattningens instrumentfrågor. **[Notes on mensuration instruments.]** *Svenska SkogsvFören. Tidskr.* 57 (3), 1959 (393–402). 7 refs. [Sw.]

Discusses calipers, bark thickness gauges, increment borers, relascopes, and dendrometers, with suggestions for improvements as to weight, accuracy, readability etc. and notes on experimental models.

521. Diameter (Girth) and Sectional Area

See also Nos. 1551, 1674, 2179–80, 2188, 2196.

2156. BITTERLICH, W. Sektorkluppen aus Leichtmetall. **[Calipering forks made of light alloys.]** *Holz-Kurier, Wien* 14 (35), 1959 (15–7). [G.]

Describes handy collapsible models, weighing 700 and 430 g. respectively, of the *Tarifmesswinkel* (*a*) [cf. *F.A.* 18 No. 4385] and the simpler *Visiermesswinkel* (sighting fork caliper), both made in Germany. The arms (set at a fixed angle of 135° in both models) are pressed against the stem; the observer's eye is aligned so that a sighting needle on the handle of the instrument appears to coincide with the right-hand edge of the stem, and readings are then taken on graduated scales fixed to the near side of the right arm, which curves towards the observer. While both types give diam. and b.a. readings, (*a*) has, in addition, a volume scale and provision for the sighting needle to be placed in 45 different positions, each corresponding to a particular volume tariff (selected from simple tables), and 2 or 3 needles can be inserted so that direct volume readings can be taken for that number of species in a mixed stand.

2157. BITTERLICH, W. Die Tarifstichprobe mit Tarifmesswinkel und Relaskop. **["Tariff-sampling" with tariff fork caliper and relascope.]** *Allg. Forstztg.* 70 (19/20), 1959 (225–6). 3 refs. [G.]

Proposes a method of representative sampling as follows. The trees counted in an angle count [sweep] are temporarily numbered with metal number tags, recorded by species, stem quality and crown class, and calipered with a fork caliper [see preceding abstract] which is fitted with a scale showing the stem numbers/ha. represented by a given d.b.h. when using a 'count factor' of 4 (i.e. each stem representing 4 sq. m./ha.). Relative form-heights of mean stems [cf. *F.A.* 20 No. 4971] are then determined, choosing for each sampling position 1 or 2 stems at, or just above, the middle of the d.b.h. distribution of the counted trees, and the correct needle position for each species or species group is read from a table [given in the paper]. Each tree is then calipered again for volume. By multiplying volumes and stem-numbers/ha. for each diameter class, total volume/ha. is found with the desired degree of break-down.

2158. SMALL, J. A., and MONK, C. D. **Winter changes in tree radii and temperature.** *For. Sci.* 5 (3), 1959 (229–33). 8 refs.

Radial changes were recorded on the 8 major compass bearings in two White Ash [*Fraxinus americana*] trees for a 6-day period during which the air temperature fluctuated above and below freezing. The average radial change (of 16) plotted against time was remarkably similar to the air-temperature change so plotted. Statistical analysis showed a significant correlation between average radius and air-temperature changes. The radial change was interpreted as a physiological phenomenon of exosmosis resulting from freezing in the intercellular spaces, which produces an over-all contraction in tree radius. *From authors' summary.*

2159. PANIĆ, Đ. O koeficientu opadanja prečnika bukve na Rudniku u naročite svrhe. **[A coefficient of diameter diminution [taper] in Beech in the Rudnik massif for special purposes.]** *Šumarstvo* 12 (5/6), 1959 (273–81). 3 refs. [Serb.f.]

[Cf. *F.A.* 14 No. 3584.] The coefficient d.b.h./D (where D is the [mean] stump diameter) was found to be 0·650 for coppice, and 0·686 for high forest.

The influence of site factors and type of stand on the magnitude of the coefficient is also discussed.

2160. KENDALL, R. H., and SAYN-WITTGENSTEIN, L. **An evaluation of the relascope.** *Tech. Note For. Br. Can.* No. 77, 1959. pp. 26. 24 refs.

Presents a summary of available information from as many sources as possible, including results of tests carried out in E. Canada since 1957, as a guide to the comparative qualities of the instruments, the method of their application, and their suitability for use in E. Canada. Advantages and disadvantages are summarized.

2161. **[Studies on the angle-count method.]** *For. Sci., Peking* 1959 (5), (403–15). 1 ref. [Chin.e.]

Approaches the basic principles and theory of Bitterlich's *Winkelzahl* method from a mathematical point of view. Describes methods developed in China for estimating: (1) the number of trees per unit area of stand; (2) mean stand diameter; (3) mean stand height on slopes. Field trials have shown the methods to be accurate and fairly simple.

2162. MAEZAWA, K. **[Bias due to edge effects in the Bitterlich method, and its examples.]** *Misc. Inform. Tokyo Univ. For.* No. 12, 1957 (229–44). 9 refs. [Jap.e.*e.*]

Discusses the extent of error occurring if part of the circular areas sampled by angle counts from random points falls outside the stand area, and tests the formulae developed on data from a 0·2-ha. stand of even-aged planted *Cryptomeria japonica.* It is concluded that the error may be neglected provided that the stands are homogeneous, the area surveyed of adequate size and not too irregular in shape, and the counting angle not too small.

2163. HAGA, T., and MAEZAWA, K. **Bias due to edge effect in using the Bitterlich method.** *For. Sci.* 5 (4), 1959 (370–6). 7 refs.

[See preceding abstract.]

2164. CUNIA, T. **Notes on cruising intensity by the Bitterlich method.** *J. For.* 57 (11), 1959 (849–50). 1 ref.

Disputes Afanasiev's statement [cf. *F.A.* 19 No. 4592] that the Bitterlich method of cruising "cannot be described in terms of a single percent of intensity", and shows that the intensity of the cruise is a function of (1) the number of sample points randomly chosen, (2) average b.a. per tree, and (3) size of the cruising area.

2165. STAGE, A. R. **A cruising computer for variable plots, tree heights, and slope correction.** *J. For.* 57 (11), 1959 (835–6). 3 refs.

Describes and illustrates the computer (circular slide-rule) which expresses slope distance to boundary trees as a continuous function of tree diameter and slope angle, making the combined use of prism and tape easier and more efficient. Details are given of the use of the instrument, which is most useful in brushy, steep terrain.

522. Height, Length

See also Nos. 2161, 2165, 2188, 2222–5.

2166. KRAMER, H. Die Oberhöhe als Bestandesmerkmal. **[Top height as a stand characteristic.]** *Allg. Forst- u. Jagdztg.* 130 (10), 1959 (241–55). 79 refs. [G.g.e.]

Discusses various methods (used or proposed in research or yield tables) of computing representative stand heights from a fixed number or proportion of the tallest trees or those of largest diam. (with or without regard to crown classes), and compares their biological significance, reliability, relation to mean height and the effect on them of stand age and structure, by reference to height curves from 179 Beech sample plots in Westphalia, representing 5 thinning regimes. Linear regression equations for mean height as a function of top height are presented for each treatment, the top height used being based on Weise's formula (arithmetic mean of the height of the 20 thickest stems out of 100) by a system of weighting for different thinning regimes.

523. Bark

See also Nos. 2169, 2186, 2294, 2557.

2167. HOFFMANN, J. Untersuchungen über die Rindenstärke der Fichte auf verschiedenen Standorten im südöstlichen Thüringer Wald. **[The bark thickness of Spruce on various sites in the S.E. Thüringer Wald.]** *Repr.* from *Wissenschaftliche Zeitschrift der Technischen Hochschule Dresden* 7 (2), 1957/1958 (361–8). 3 refs. [G.g.]

Presents a table of double bark thickness at breast height for 4 site types differing in soils, humus, water regime etc., on the basis of > 14,000 measurements on 167 plots. The bark factor, i.e. the d.b.h. o.b./u.b. ratio, was independent of diameter but not of site, increasing from 1·053 on the best to 1·074 on the poorest sites. A bark gauge made at Tharandt some time previously proved more satisfactory than a recent Swedish model; both are illustrated and described.

2168. PUDDEN, H. H. C. **Report on silvicultural research for the year 1958. Bark thickness: *Cupressus lusitanica*.** *Extr.* from *Rep. For. Dep. Kenya 1958*, 1959 (15).

Bark thickness was found to be in close linear relationship with the diameter at which it is measured and, for any given diameter, independent of height from the ground.

524. Determination of the Volume of Trees and Stands

524.1. Principles of Volume Determination. Form (Taper)

See also Nos. 1781, 2159, 2171–2.

2169. CARRON, L. T., and MCINTYRE, G. A. **The taper line (Gray) and sectional methods for merchantable volume of *Pinus radiata* stems.** *Aust. For.* 23 (1), 1959 (50–60). 5 refs.

The taper-line (Gray) [cf. *F.A.* 18 No. 714] and sectional methods, as commonly used in Australia to derive merchantable volume (under-bark volume from ground to 4 in. d.u.b.) of *Pinus radiata* stems, are described and compared. Studies of bias in the methods are outlined. For one study of the taper-line method, in which each of 6 observers nominated points of measurement by three different prescriptions on each of 10 felled trees, the average bias in the method for the different prescriptions is given and variation in the bias of observers is discussed. In another study, 53 standing stems were measured by both methods, using girth tape and bark gauge. The trees were then felled, measured directly under bark at the same points measured over bark on the standing trees, and volume re-calculated. The trees were also measured directly under bark at short intervals to derive graphically a very close approximation to the true merchantable volume. Thus, in deriving merchantable volume, bias due to the method of measuring volume could be separated from bias due to the measurement of bark thickness by bark gauge. The two methods showed a similar mean bias in volume of about − 2½%; the variation in the bias of observers is discussed. Experience from other investigations suggests that the equality of bias in the methods shown here is a chance result, and more studies, with different observers and different stands, are necessary before any generalized conclusions can be drawn. Meanwhile, the result of this one investigation might be used as a guide in assessing the advantages and disadvantages of the methods. For merchantable volume from over-bark measurement, there was superimposed a mean bias of about − 4·7% for both methods, due to wrong bark-thickness measurements. *Authors' summary.*

2170. Kallio, K. Kapenemisluokan huomioon ottaminen erotusmenetelmän mukaisessa kasvun laskennassa. **[Consideration of the taper class in increment calculation by the "differential" method.]** *Metsät. Aikak.* 1958 (11), (385–7). 9 refs. [Fi.]

Discusses the problem of determining the taper class of stems, from sample trees of the current final growing stock, without increment cores. From data in a study previously published [see *F.A.* 19 No. 3329], taper-class curves were drawn for 2-cm. d.b.h. classes and different ages (30–100 years) in Spruce on an OMT site. The results show that, for a given d.b.h., taper decreases with increasing stand age and height, and more so in dominated than in dominant trees. On the other hand, at a given age and height, the taper increases with increasing d.b.h., and more in thinned or open stands than in unthinned dense stands.

524.3. Volume of Tree Groups and Stands

See also Nos. 2156–7, 2160–5, 2181, 2188, 2225.

2171. Čokl, M. Tarif za sestoje prehodnih oblik. **[Volume tariffs for transitional [between selection and even-aged] stands.]** *Gozd. Vestn.* 17 (7/8), 1959 (221–8). 6 refs. [Sloven.g.]

Algan's tariffs are used mainly for the selection forests, and Schaeffer's for the even-aged stands in Slovenia. For transitional stands, intermediate tariffs were worked out, according to the formula

$$v = \frac{k}{1600}(d - 2{\cdot}5)(d - 7{\cdot}5),$$

where v = volume of tree of diam. d, and k = volume of tree of diam. 45 cm. These tariffs are given in one table, and another table allows correct tariff class to be read directly from the height of the mean tree (for Beech, Pine, Spruce, Silver Fir). Tables of form heights for transitional, selection, and even-aged stands are also given.

2172. Hengst, E. Allgemeine Bemerkungen zur Weymouthskiefer und zu ihrer Form. **[Notes on *Pinus strobus* and its stem form.]** *Arch. Forstw.* 8 (9), 1959 (781–811). 14 refs. [G.g.russ.e.]

Presents and re-analyses data from old Saxon trial plots between 54 and 79 years of age [originally discussed in papers by M. Kunze in 1900 and A. Schwappach in 1890], describing site conditions, height growth, diameter distribution, density of stocking etc., partly in comparison with Spruce and Scots Pine. On the basis of ca. 600 sectionally measured stems, artificial form factors are computed and a volume table for wood > 7 cm. in diam. is presented, which is closer to Spruce than to Scots Pine. *From author's summary.*

2173. Leoni, A. Una tavola volumetrica preliminare per il pino silvestre nella brughiera lombarda. **[A preliminary volume table for *Pinus sylvestris* on the heaths of Lombardy.]** *Monti e Boschi* 10 (11), 1959 (574–80). [It.]

2174. Skinner, E. C. **Cubic volume tables for Red Alder and Sitka Spruce.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 170, 1959. pp. 4. 1 ref.

Three tables supplementing or amending those already published [see *F.A.* 15 No. 534].

2175. Thornton, P. L. **A volume study of Sugar Maple sawtimber in northern Michigan.** *Tech. Bull. Ford For. Cent., L'Anse* No. 5, 1959. pp. 3.

Data from 393 trees are used to evaluate the applicability of two gross board-foot volume tables commonly used in the Lake States.

2176. Dabral, S. N., and Singh, M. M. **Volume tables for *Acacia arabica*, Willd. (mainly applicable to Poona Division, Bombay State).** *Indian For. Rec. (n.s.) Silviculture* 10 (5), 1957 (1959), (115–25). Price *Rs.* 1.50 (2*s.* 3*d.*)

2177. Dawkins, H. C. **General volume table for *Eucalyptus saligna*.** *Tech. Note For. Dep. Uganda* No. 72, 1959. pp. 2.

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

See also Nos. 2156–7, 2160–5.

2178. Otomo, E., *et al.* **[Research on the method of forest inventory (I). Research on the sampling method by the use of aerial photographs (1).]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 114, 1959 (1–32). 60 refs. [Jap.e.]

Describes a small survey based on aerial photographs combined with ground sampling. Before sampling was done, the whole area (596 ha.) was stratified into two strata—plantations and natural stands, and 33 sample plots (20 × 50 m.) were allotted to the former and 34 to the latter, giving a 1·18% total sample. The results were more efficient by 8·2% than those given by simple random sampling.

2179. ORR, T. J. **Timber stand maps, plotless cruising, and business machine computation as elements of a timber survey method.** *J. For.* 57 (8), 1959 (567–72). 8 refs.

Discusses, in some detail and with an example, the three elements of the timber survey method described, which developed from an attempt to evaluate in quantitative terms the attributes of certain timber types as shown on aerial photographs.

2180. LUDVIGSEN, F. P. Relaskoptakst—prøveflatetakst: en sammenligning av resultatene ved de to takstemetoder. **[Volume determination by relascope and by sample plot: a comparison of results by the two methods.]** *Norsk Skogbr.* 5 (22), 1959 (611–2). [Nor.]

Sample-plot data and relascope measurements by 26 gangs showed that while systematic errors were very variable between the gangs, ranging from + 33 to − 21%, sample-plot data could be used to give a satisfactory correction factor.

525. Volume by Assortments. Merchantable Volume

See also Nos. 1855–6, 1993–5, 2118, 2246.

2181. MESCHINI, A. Tavola dendrometrica del pino domestico di S. Rossore cresciuto in fustaia coetanea. **[Volume table for the *Pinus pinea* of S. Rossore, grown in even-aged stands.]** *Ital. for. mont.* 14 (5), 1959 (188–95). [It.it.f.]

Gives volumes by assortments, by 5-cm. diam., and 2-m. height classes.

2182. STONE, R. N., and CHASE, C. D. **Sawtimber log grades in Wisconsin.** *Tech. Note Lake St. For. Exp. Sta.* No. 563, 1959. pp. 2. 2 refs.

Includes a table of the distribution of merchantable volume over log grades for 9 species, and, for Sugar Maple only, the relations of log grade to diameter class.

526. Log Measurement. Scaling

2183. DJURBERG, G. Timmermätning i Värmland. **[Timber measurement in Värmland.]** *Norsk Skogind.* 13 (11), 1959 (400–3). [Sw.] P.R.

Discusses the scalers' code of practice when measuring log volume, diam. and length, and in log grading.

2184. KÜBLER, H. Die russische Kubiktabelle für die Ermittlung des Inhalts liegender Baumstämme. **[The Russian volume tables for felled timber.]** *Holz-Zbl.* 85 (148), 1959 (1996). [G.g.]

Describes and discusses the Russian volume tables (forming part of Russian standard GOST 2708–44). These are based on top diameter, rounded up or down to the nearest 2 cm., and, partly because they go back to tables for Spruce butt logs only (drawn up by V. Krüdener in 1911), they deviate considerably from true volume, particularly for middle and top logs. Volumes for large, cylindrical logs are too high, those for small, tapering logs too small. The German trade estimates that mean values are 7·5% higher than by the German regulations (Homa) based on mid-diameters. A considerable part of this difference is due to the different rules for rounding off diameters. [Cf. *F.A.* 19 Nos. 2490–1.]

2185. SWAN, D. A. **Mill experience with weight scaling of pulpwood in the Northeast.** *Paper Tr. J.* 143 (11), 1959 (48–50). P.O.

Discusses the successful experience of two mills that have changed from volume to weight scaling and presents tabulated results of a comparative study on the cu.-ft. and cord weights of 8 hardwoods and on estimated and actual truckload weights.

2186. LANDT, E. F., and WOODFIN, R. O. **Pulpwood characteristics of Black Hills [Dakota] Ponderosa Pine.** *Tappi* 42 (10), 1959 (809–12). 8 refs. P.R.

Presents tabulated data on the characteristics (i.e. for average tree and stand, wood, and average cord stacked in 100-in. bolts) or pulpwood-size trees cut on 39 plots in S. Dakota and Wyoming. A stacked cord of rough bolts from 50- to 100-year stands contains 59, 19 and 22% of wood, bark and air-space respectively; a rough green cord weighs 4950 (including 560 lb. of bark) vs. 5560 lb. for a barked cord. An air-dry barked cord weighs 2620 lb. and contains ca. 550 lb. more wood than a similarly dried rough cord. The requirements of barked and unbarked wood per ton of sulphate and groundwood pulp are compared, and accord essentially with those of Lake States Jack and Lodgepole Pine.

2187. LEPPÄNEN, V. **Measuring pulpwood by immersion.** *Finn. Pap. Timb.* 10 (8), 1959 (98–9). [E.]

Describes, with illustrations, the equipment, comprising a basin in which pulpwood bundles are immersed, and tanks in which the displaced water is caught and measured, used at the Joutseno-Pulp Osakeyhtio, Joutseno. An accuracy of ± 0·17%, irrespective of timber quality and other factors, is reached with bundles having a solid volume of 12 cu.m. Measuring is done in summer only, and $\frac{1}{10}$ of the pulpwood coming to the mill is measured. Capacity is 3–4 bundles/hour, i.e. ca. 350 cu.m./8-hr. day, and one man carries out the work. Comparison of costs before and after installation show that the equipment will pay for itself in 3 years.

527. Solid Volume of Stacked Products (including Converting Factors)

See Nos. 2185–7.

53. Special Measurements of Trees and Stands (Crown Dimensions, Stand Density etc.)

See also Nos. 2161, 2222, 2225.

2188. VICHAIDIT, V. **[The correlation between crown diameter and height, basal area and volume of *Shorea obtusa*.]** *Vanasarn* 17 (3), 1959 (29–37). [Siam.e.]

A statistical study based on 200 trees in the dry dipterocarp forests of Nakhon Ratchasima province, Siam. An approximately straight-line correlation was established between crown diameter and total height, b.a. and volume.

54. Assessment of Site Quality

See also Nos. 1325, 1340, 1346, 1596, 2198, 2373.

2189. PATERSON, S. S. Fyokorologiskt bidrag till kännedomen om några grundfaktorer för Sveriges skogliga produktivitet. **[A study, based on productivity regions, of some basic factors in Swedish forest productivity.]** *Repr.* from *Festskrift till O. Jonasson.* Göteborg. 1959. pp. 159–68. 40 refs. [Sw.]

Discusses the author's CVP index [cf. *F.A.* 20 Nos. 3567–8] and its use in dividing a region into "phyochores" or "productivity regions". Presents a map of Sweden showing the distribution of CVP classes and the "ideal site class" or "potential mean site class" (B_{pm}), based on the figures of the first national forest survey and expressed in cu. m./ha. Distinguishes the terms "productivity relief map" showing the distribution of potential yields per unit area, and "production relief map", showing the actual yields. Variations in productivity from W. to E. ("productivity profiles") and from S. to N. are shown in a graph. In S. Sweden there is a decrease in B_{pm} of 0·1 cu. m./ha. and in N. Sweden of 0·3, with each 100 km. northwards. Variations from W. to E. are related to the main mountain range and to the degree of continentality of the climate. Within the lower productivity classes (CVP < 150, $B_{pm} < 4$ cu. m./ha.), i.e. over the whole of Norrland, a close correlation was found between CVP and B_{pm}, suggesting that there is no great variation in soil type or in past forest treatment in the region. Fairly wide differences between CVP and B_{pm}, however, were found in S.E. Småland, Blekinge and Skåne and on Öland, where the B_{pm} is 20% or more above the normal for the climate—differences attributed to the wide distribution of brown earths as opposed to podzols in this part of Sweden; but on Gotland the relationship follows the normal pattern in spite of the preponderance of brown earths.

2190. EBELING, F. Bonitering av skogsmark—trolleri med tabeller eller tillämpad biologi? **[Determining the site class of forest soils—magic with tables or applied biology?]** *Skogen* 46 (23), 1959 (472–5). [Sw.]

Deprecates excessive dependence on site-class tables and stresses the need for a biological approach, and particularly for a study of available nutrients in relation to the site's latitude and altitude, the forest types and stand history; loss of nutrients (e.g. by leaching after clear felling); and accretion of nutrients from the atmosphere in the precipitation. Presents a map and graphs showing, for different parts of Sweden, the amounts of N added to the soil from the atmosphere.

2191. MOGREN, E. W. **Slope and aspect as indicators of site for Ponderosa Pine in the Black Hills.** *Res. Note Colo. Coll. For. Range Mgmt.* No. 11, 1959. pp. 2. 2 refs.

A method of expressing site quality for Ponderosa Pine in terms of slope and aspect was tested against values determined from site-index curves based on height, and an analysis of variance made. It is concluded that the Black Hills site-area classification successfully delineates site quality (as expressed by site-index values) for local areas, but fails to differentiate site productivity as precisely as do site-index values. It is not a consistent measure of site quality, but varies throughout the forest.

2192. FOSTER, R. W. **Relation between site indexes of Eastern White Pine [*Pinus strobus*] and Red Maple [*Acer rubrum*].** *For. Sci.* 5 (3), 1959 (279–91). 22 refs.

The purpose of this study was to determine whether Red Maple trees would be useful indicators of site quality for growing Pine in situations where Pine site index could not be determined directly. A significant relation was established and an equation developed predicting Pine site index in terms of Red Maple height and age, and aspect.

2193. CHAIKEN, L. E., and NELSON, T. C. **Site index curves for Piedmont Virginia Pine.** *Res. Note Stheast. For. Exp. Sta.* No. 135, 1959. pp. 2. 4 refs.

The curves, based on an index age of 50, are derived from 166 sample plots aged 10–70 years, mostly on old fields, in Virginia, N. and S. Carolina, and Maryland. Site index increased with a decrease in latitude, having means of 63·9 ft. in Virginia and 77 in S. Carolina.

2194. OLSON, D. F., and DELLA-BIANCA, L. **Site index comparisons for several tree species in the Virginia-Carolina Piedmont.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 104, 1959. pp. 9. 10 refs.

A study based on 155 plots in Upland Piedmont mixed stands, similar to one in the Southern Appalachians [cf. *F.A.* 20 No. 3572]. Here, too, *Liriodendron tulipifera* had the highest site index on good, and the lowest on the poorest sites. Apart from the latter, *Pinus echinata* had the lowest, the Oaks (*Quercus alba*, *Q. velutina*, *Q. coccinea*, *Q. falcata* and *Q. rubra*) and *P. virginiana* showing intermediate values.

2195. LANGDON, O. G. **Site index curves for South Florida Slash Pine.** *Res. Note Stheast. For. Exp. Sta.* No. 133, 1959. pp. 2.

Presents curves for height at 25 years for *Pinus elliottii* var. *densa*, based on 90 plots aged 8 to 61 years. The average was 50 ft. In general, existing curves [cf. *F.A.* 19 No. 2135; 20 No. 4997] based on both varieties (*densa* and *elliottii*) over-estimated the site index in the younger ages and poorer sites.

2196. MAGNUSKI, K. Próba zastosowania statystycznych metod analizy wyników do badania zmienności przeciętnej pierśnicy drzewostanów. **[Investigations on the statistical analysis of results in the study of variations in mean stand d.b.h.]** *Sylwan* 103 (8), 1959 (17–30). 7 refs. [Pol.russ.e.]

The investigation was made in Pine stands aged 61–70 years, density 0·8, site class I or II, growing on four different site types: (1) 'fresh' *Pinetum*, (2) 'fresh' mixed *Pinetum*, (3) mixed forest, (4) 'fresh' forest. The purpose was to determine whether differences between mean d.b.h.'s were significant and affected by site. The mean d.b.h. of stands on (1) was shown to differ significantly from that of stands on (2), (3) and (4); but there were no significant differences between (2), (3) and (4) caused by site conditions. The variability of mean d.b.h. on (2), (3) and (4) precludes its use as a measure of site quality and productivity on these sites.

2197. SETH, S. K., and BHATNAGAR, H. P. **Soil suitability index for Sal (*Shorea robusta*) natural regeneration.** *Indian For.* 85 (11), 1959 (631–40). 7 refs.

Pot cultures were made with 14 different soils from the main Sal types in Uttar Pradesh, and some 14 soil characters investigated. Of these, only soil pH (1), moisture *in situ* (2), water-holding capacity (3), moisture equivalent (4), and organic-matter content (5) showed a definite relation to height increment. Of these, (1) is unsuitable as an index owing to the small range of dispersion of its values; and (2) is largely dependent on climatic conditions. A statistical analysis was therefore carried out to test the multiple correlation between (3), (4) and (5), and it was found that height increment could be expressed as a function of x, x^2, y, y^2 (where $x =$ organic matter % and $y =$ moisture equivalent %), each of which contributed significantly. Lower levels of x and higher values of y indicate superior conditions for Sal growth. Since (5), like (1), varies within comparatively low limits, an attempt was made to develop an equation using (3) and (4), and it was found that a linear relationship could be established with (4): $S = -8{\cdot}250381 + 0{\cdot}417322\,y$ where $S =$ height growth in cm. in one year (suitability index) and $y =$ moisture equivalent %.

56. Increment. Development and Structure of Stands

See also Nos. 1566, 1596, 1621, 1623, 1626, 1631, 1635, 1653 *et seq.*, 1741, 1748–51, 1768 *et seq.* 2046, 2118, 2373.

2198. HENGST, E. Einige zeitnahe ertragskundliche Fragen und Versuchsarbeiten des Instituts für Forstliche Ertragskunde. **[Present-day problems in yield studies and current research at the Section for Yield Studies [of the Faculty of Forestry, Tharandt].]** *Repr.* from *Wissenschaftliche Zeitschrift der Technischen Hochschule Dresden* 7 (5), 1957/1958 (1033–44). 9 refs. [G.g.]

Includes a discussion of the effect, on yield and on growth patterns, of site, provenance and, particularly, thinning, with some (partly unpublished) data on Beech, Douglas Fir, Silver Fir, Spruce and Scots Pine, and a brief description of newly established plots for the study of the structure of selection forests and problems of conversion.

2199. MAGIN, R. Struktur und Leistung mehrschichtiger Mischwälder in den bayerischen Alpen. **[Structure and yield of multi-storeyed mixed forests in the Bavarian Alps.]** *Mitt. StForstverw. Bayerns* No. 30, 1959 (1–161). 121 refs. [G.]

Mainly a résumé of information previously published on the stands as a whole [cf. *F.A.* 17 No. 4326; 19 No. 2157; 20 No. 860; 21 No. 825], though frequently in greater detail and with more supporting data. In addition, stem analyses are given of 27 Spruce, 21 Silver Fir and 6 Beech stems representing widely differing stem forms and growth patterns.

2200. MITSCHERLICH, G. Untersuchungen über das Wachstum der Fichte in den ehemals preussischen Landesteilen von Rheinland-Pfalz. **[The growth of Spruce in the former Prussian territories of Rheinland-Pfalz.]** *Allg. Forst- u. Jagdztg.* 130 (10), 1959 (256–62). 5 refs. [G.g.e.]

A study based on 186 temporary sample plots including Petri's [cf. *F.A.* 20 No. 870]. Yields were generally higher than those given by Wiedemann's tables, particularly on the best sites.

2201. ILVESSALO, Y. Forholdet mellom utviklingen av tynnede og urørte skogbestand i Finnland. **[The relationship between development of thinned and untouched forest stands in Finland.]** *Norsk Skogbr.* 5 (20), 1959 (543–5). [Nor.]

Some data are presented in graphs, from studies on unthinned stands begun in 1916–19 and those on thinned stands begun in the late 1940s. For Pine on *Vaccinium* sites, mean volume for individual trees at 100 years was 0·551 and 0·428 cu. m. in thinned and unthinned stands respectively; total yields were continuously higher on the thinned stands after ca. 40 years, and although the results from the two series of measurements are not entirely comparable, the difference in yield is probably genuine. For Spruce on *Oxalis-Myrtillus* sites, total yield was the same up to 30 years, and was higher thereafter for the thinned stands, the absolute difference increasing with age; the curve for timber loss (through thinning or self-thinning) from 30 to 110 years shows the low capacity of Spruce for self-thinning. Figures for Birch on *Oxalis-Myrtillus* sites are not completely comparable because in the earlier series *Betula pubescens* and *B. verrucosa* were not separated. At 30 years the number of trees in the thinned stand was only 25% of that in the unthinned one, and, in spite of heavy self-thinning, the figure had increased only to 36% by 80 years. Total yield in the thinned stands was higher for *B. verrucosa* than for *B. pubescens*. Mean figures for total yield of the two species in the thinned stand were 30–50 cu. m./ha. above those for the unthinned one over the period 30–80 years. Amounts of timber removed by thinning were considerably higher than those from self-thinning in the unthinned stands.

2202. PARDÉ, J. Contribution à l'étude de la productivité des reboisements solognots. **[The**

productivity of plantations in the Sologne.] *Rev. for. franç.* 11 (12), 1959 (854–68). 9 refs. [F.]

Gives tabulated data (species, type of plantation, soil, stand density, b.a., girth of mean tree, mean stand height, growing stock in cu. m. of sawtimber, volume of thinnings, and total yield from establishment in cu. m./ha./year) for experimental plantations of *Pinus nigra* var. *calabrica*, *P. sylvestris*, *P. strobus*, *P. pinaster* and *Pseudotsuga taxifolia*, on different types of lande, and discusses their practical application.

2203. VĂČOVSKI, H. Za rasteža na edna čerborova kultura v Strandža. **[The growth of a *Pinus nigra* var. *austriaca* plantation in Strandža [Bulgaria].]** *Gorsko Stopanstvo* 14 (9), 1958 (14–5). [Bulg.]

Tabulates data on height and diameter growth (m.a.i. and c.a.i.) up to 28 years. Standing volume is 210·7 cu. m./ha., and m.a.i. is 7·5 cu. m.

2204. BUSTAMANTE EZPELETA, L., CANCIO MORENZA, G., and PEDRO ABELLÓ, S. DE. Sección de celulosa y fibras textiles forestales. Resumen de los trabajos epidométricos relativos al *Eucalyptus globulus* Labill., realizados por la Sección de Celulosas del Instituto Forestal de Investigaciones y Experiencias. **[Section for cellulose and forest textile fibres. Summary of mensurational studies relating to *E. globulus* carried out by the Cellulose Section of the Forest Research Institute.]** *An. Inst. For. Invest. Exp. Madrid* 30 (3), 1958 (121–37). [Span.]

Presents preliminary data collected over 24 years, mainly in northern Spain, with the object of drawing up yield tables for *Eucalyptus globulus*.

2205. BUSTAMANTE EZPELETA, L., CANCIO MORENZA, G., and PEDRO ABELLÓ, S. DE. Sección de celulosa y fibras textiles forestales. Estudio sobre el crecimiento del monte bajo comparado con el del monte alto en el *E. globulus*—según datos póstumos de D. Ignacio Echeverría. **[Section for cellulose and forest textile fibres. Increment of coppice compared with that of high forest in *E. globulus*—according to posthumous data of D. Ignacio Echeverría.]** *An. Inst. For. Invest. Exp. Madrid* 30 (3), 1958 (139–49). [Span.]

Comparative results are presented from numerous sample plots in Santander. Collective comparisons of m.a.i. (height, diameter and volume) in coppice forest with maximum and minimum values for annual increment in high forest showed no advantage, and in fact often an inferiority, in the coppice stands. In direct comparisons of plots of the same age and the same site class, only in one case did the coppice forest show superiority.

2206. CARRERAS, A. E. DE LAS. Resultados de la explotación de un eucaliptar de diez años de crecimiento. **[Results of the exploitation of a 10-year-old Eucalypt stand.]** *Rev. for. argent.* 3 (3), 1959 (85–7). [Span.]

Summarizes primary conversion methods in, and yield of products from, clear felling an unthinned stand of *Eucalyptus rostrata*, 3·27 ha. in extent and with ca. 1780 trees/ha., the main product being pulpwood.

2207. MESSERI, A. Appunti su una popolazione di *Populus tremula* L. della Sila (Calabria). I. Analisi auxometrica. **[Notes on a stand of *P. tremula* at Sila, Calabria. I. Stem analysis.]** *Pubbl. Cent. Sper. Agric. For., Roma* 2, 1958 (1959), (23–42). 17 refs. [It.it.e.*e.*]

Stem analyses were made on 4 trees, 65–70 years old, and distinguished by their large size and regular form. The data are set out in tables and graphs with captions in English, showing variations in height and periodic height increment, stem radius at different heights for the 4 compass points, periodic diam. increment at different levels, periodic volume increment, and volume increment % at different ages.

561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

See also Nos. 1323, 1433, 1553, 2170, 2212, 2305, 2317.

2208. LANDA, M. **Climatic fluctuations and their effect on annual growth rings and on growing stock.** *Scot. For.* 13 (3/4), 1959 (154–62, 164). 40 refs.

Reviews evidence of the general warming-up of climate, and the radial increment of Scots Pine and Norway Spruce in relation to precipitation, temperature, light and sunshine, tree age, stand hygiene, thinnings and fellings, pruning, and drainage and fertilizing. International co-operative research is urged to answer such questions as whether natural forests in N. and Central Europe are growing faster; if so, by how much and since how long; and in what ways can man influence radial increment.

2209. SAVIN, E. N. O faktorah, vlijajuščih na prirost drevesnyh porod v zasušlivoj stepi. **[Factors influencing the increment of woody species in droughty steppe regions.]** *Bot. Ž.* 44 (6), 1959 (854–60). 7 refs. [Russ.]

Analyses the diameter and volume increment of Oak and *Acer platanoides* in a mixed 27-year-old plantation on droughty southern chernozems, in relation to air temperature, soil moisture and precipitation. Tabulated data cover 1949–53, but owing to incomplete information or to insect damage obscuring the results, most attention is paid to the years 1950–52. *A. platanoides* reacted more strongly than Oak both to high and low amounts of moisture. It was also found that damage to the leaves by insects in one year caused a greater reduction of increment than did almost complete absence of precipitation during May/July of another year.

562. Volume Increment

2210. MILETIĆ, Ž. Analiza nekih metoda određivanja broja i zapremine uraslih stabala. **[Analysis of methods of determining the number and volume of recruitment.]** *Šumarstvo* 12 (5/6), 1959 (239–50). 8 refs. [Croat.f.]

Reviews French and Jugoslavian methods [cf.

F.A. 13 Nos. 547–8; 16 No. 778). It is concluded that the method of Schaeffer, Gazin and d'Alverny (1930) gives results nearest to the theoretical number and volume of trees for both recruitment and annual felling.

2211. Gedney, D. R., Johnson, F. A., and Hicks, V. E. **Some estimates of growth and mortality from the Malheur national forest in Eastern Oregon.** *Res. Note Pacif. Nthwest. For. Range Exp. Sta.* No. 166, 1959. pp. 7.

Presents, on the basis of sample-plot data, estimates of (*a*) annual gross increment and net increment (i.e. gross increment less mortality) for stands with volumes of 2000 to 20,000 bd.ft./acre, distinguishing between a Ponderosa Pine type (occurring on 51% of the area) and other forest types; and (*b*) annual gross increment of sawtimber trees by diameter classes (also in bd. ft.) for the 4 major species (Ponderosa Pine, Douglas Fir, White Fir, and Western Larch).

2212. Kurth, H. Der gegenwärtige Stand der Zuwachsmessungen in der Forsteinrichtung der DDR. **[The present position regarding increment determination in forest management in E. Germany.]** *Forst u. Jagd* 9 (7; 9), 1959 (301–4; 417–20). 20 refs. [G.]

Describes increment-core methods now in use in E. Germany, and investigations into accuracy, sampling density etc., carried out in areas of > 400 ha. in a number of districts in Saxon or Thuringian hill country, predominantly in Spruce and Pine. The use of the "forest height tariff" [cf. *F.A.* 20 No. 2141] for volume-increment determination led, in the Spruce forests under review, to a systematic error owing to a rise in the "tariff" during the passage of time, but this was considered negligible. One increment core per tree was found to be adequate, provided that all directions of the compass were equally represented, and the systematic error unavoidable on slopes (where the uphill side only is sampled) was not significant, though further research is recommended. A comparison of two sampling series of 1300 cores taken in an area of 540 ha. showed excessively large differences in mean increment in the 17·5- and 22·5-cm. classes, but when stratification by age classes was introduced, the accuracy was considered adequate, the probable error (at the 5% level) for total increment being ± 5% for areas > 400 ha. and 2 cores/ha. Costs are estimated at ca. DM. 0.40/ha.

2213. Hall, O. F. **The contribution of remeasured sample plots to the precision of growth estimates.** *J. For.* 57 (11), 1959 (807–11). 12 refs.

Discusses the topic, citing two actual examples in which remeasurement of permanent sample plots reduced the sampling error of growth to ¼ of that attainable from successive inventories with temporary plots. Analysis of a 90,000-acre forest showed that 254 permanent sample plots gave a precision that would have required 3970 temporary plots.

564. Forecasting Increment

2214. Patrone, G. Stima dell'incremento dell' immediato futuro di una fustaia coetanea. **[Estimating the increment of an even-aged stand in the near future.]** *Ital. for. mont.* 14 (4), 1959 (159–61). 1 ref. [It.it.f.]

Outlines the two methods most frequently used for calculating the current increment of an even-aged stand up to the year t_1 when that of the year t_0 is known and the value of $t_1 - t_0$ is very small. The author discusses the particular values derived when t approaches the age of maximum m.a.i. or of maximum c.a.i.

566. Yield Tables and Their Construction

2215. Christie, J. M. **Preliminary yield table for Poplar.** *For. Rec. For. Comm., Lond.* No. 40, 1959. pp. 14. 2 refs. Price 1*s*. 6*d*.

The construction of these tentative tables was only possible with the limited data available because of the good correlation of total volume production with height, a correlation that was found to be dependent on spacing. The data, though mainly derived from measurements of Hybrid Black Poplars, are also likely to be applicable to the Balsam Poplars grown in Great Britain, at least in the early age classes. The tables confirm experience elsewhere, that the exceedingly fast growth of individual Poplars is not quite matched by the volume production per acre, which is higher than that of other broadleaved species in Britain but is considerably lower than that of some of the exotic conifers such as Sitka Spruce. There are many young Poplar trial plots throughout Britain, which will soon enable more reliable estimates of growth to be made. *From author's summary.*

2216. Moiseenko, F. P. Hod rosta dubovyh nasaždenij semennogo proishoždenija v BSSR. **[The rate of growth of [natural] Oak stands of seedling origin in the Belorussian SSR.]** *Lesn. Hoz.* 11 (12), 1958 (16–8). [Russ.]

Presents yield tables, based on data from 41 sample plots, for Oak stands aged 30–180 years in (*a*) Oak/Ash/Hornbeam type forests (site class I), (*b*) Oak/Hornbeam/*Oxalis* type forest (II), and (*c*) Oak/Hornbeam/*Myrtillus* type forests (III).

58. Surveying and Mapping. Aerial Survey

See also Nos. 2178–9.

2217. Buckingham, F. M. **Area measurement by weight. A useful technique in forest inventory.** *Tech. Rep. Fac. For. Univ. Toronto* No. 2, 1959. pp. 9. 4 refs.

[Cf. *F.A.* 18 No. 4459.] Gives the results of tests comparing the speed and accuracy of (*a*) area measurements by weighing, and (*b*) area estimation by the standard dot-counting method. In (*a*), a plastic-backed transparent film (consisting of plastic sheeting overlaid with a thin film of non-hygroscopic tinted lacquer of uniform weight and density) was placed over the map, and type areas, even of intricate and irregular design, were easily traced and cut out of the lacquer overlay with a special swivel-action knife, the cut-outs being then weighed on a semi-automatic analytical balance and assessed on a weight/acre basis. In tests on 3 maps, (*a*) proved faster than (*b*) in two, and more accurate in all, cases, the weighing time (the longest single phase in (*a*)), being subsequently reduced by 50% by using an ultra-rapid projection balance capable of 20 readings/min.

2218. ROGERS, E. J. **Report of Working Group 4 (Foresters) Commission VII, International Society of Photogrammetry**. *Photogramm. Engng*. 24 (4), 1958 (603–16). 4½ pp. of refs. L.S.

Reviews developments in the use of aerial photographs in forestry in the United Kingdom, and British Colonies, Netherlands, Germany, Czechoslovakia, Norway, Thailand, Sweden, Finland, France, U.S.A. and Canada.

2219. APOSTOLOV, JU. S. Primenenie vertoletov MI-1 v lesoustrojstve. [**The use of MI-1 helicopters in forest management**.] *Lesn. Hoz*. 11 (7), 1958 (17–20). [Russ.]

[Cf. *F.A.* 19 No. 4665.] Discusses the use of these helicopters in the Amur region to determine stand composition and density, and mean age, diameter and height. Costs are discussed, and it is urged that if the machines were also used for transporting men and supplies, they would be even more economical to run.

2220. MALCOLM, R. M. **Helicopter use in forest surveys**. *For. Surv. Note B.C. For. Serv*. No. 2, 1958. pp. 31. 1 ref.

Reviews a number of survey operations since 1955 in which helicopters have been used by the Forest Surveys and Inventory Division for work in difficult or inaccessible country. The greatest savings in time and money were achieved in extensive surveys. Quality of field work and the effectiveness of supervision were significantly improved in all classes of survey.

2221. AVERY, G. **Helicopter stereo-photography of forest plots**. *Photogramm. Engng*. 24 (4), 1958 (617–24). L.S.

Six forest plots were marked on the ground and photographed from a helicopter at altitudes of 200–600 ft. Good stereo-pairs were obtained on panchromatic film at 200–300 ft. and were found to be slightly superior to ordinary 1 : 20,000 prints for measuring tree height and crown diameter, equally good for estimating crown closure, and slightly inferior for tree counts.

2222. ROGERS, E. J., AVERY, G., and CHAPMAN, R. A. **Three scales of aerial photography compared for making stand measurements**. *For. Res. Note Ntheast. For. Exp. Sta*. No. 88, 1959. pp. 4. 1 ref.

During the winter of 1956, a small test area in Hancock County, Maine, was photographed on infra-red film at scales of 1 : 1,000, 1 : 5,000, and 1 : 15,840. Photo interpretation was concentrated on predominantly coniferous stands. On each of twelve ⅕-acre plots, three photo-interpreters determined (1) mean total ht., and (2) mean crown diam., of the three tallest softwoods, and (3) crown closure % of the softwood stand. Analyses of variance were employed to compare photo measurements, by interpreters and by photo scales. None of the three scales tested showed a marked superiority for evaluation of mean total ht., crown diam., or crown-closure %. Though the 1 : 5,000 scale provided the most accurate results for 2 of the 3 variables tested, measurements on 1 : 15,840 prints were within an acceptable range. The 1 : 15,840 scale is therefore recommended as being the most economical.

2223. JOHNSON, E. W. **Effect of photographic scale on precision of individual tree-height measurement**. *Photogramm. Engng*. 24 (1), 1958 (142–52). 9 refs. L.S.

An experiment to determine the effect of photographic scale on the precision of tree-height measurement is described. The same 14 trees were measured twice by each of two operators, with both the parallax wedge and a parallax bar, on photographs at 1 : 20,000, 1 : 15,000, 1 : 10,000 and 1 : 5000. The resulting statistical analysis indicated that errors in tree-height measurement are not associated with photographic scale, but with some undetermined tree characteristic, probably crown shape or tree size, and with the individual operators. The evidence indicates that the two instruments give equally precise results. *From author's abstract*.

2224. JOHNSON, E. W. **A training program for men measuring tree heights with parallax instruments**. *Photogramm. Engng*. 24 (1), 1958 (50–5). 5 refs. L.S.

2225. ROGERS, E. J., AVERY, G. and CHAPMAN, R. A. **Selection of stand variables in southern Maine for making volume estimates from aerial photos**. *For. Res. Note Ntheast. For. Exp. Sta*. No. 89, 1959. pp. 3. 1 ref.

Of the variables tested (crown closure, tree height and crown diameter), crown closure was most closely related to gross cubic volume. Addition of the other two variables did not significantly improve the correlation. An aerial-photo stand volume table for Spruce/Fir/hardwood forest, based on ground measurements on 28 ⅕-acre plots is presented for 10% crown-closure classes from 40 to 100%.

2226. CARNAHAN, C. E. **Photogrammetry and road location in the U.S. Forest Service**. *Photogramm. Engng*. 24 (3), 1958 (404–10). L.S.

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION OF FOREST ENTERPRISES

61. Forest Management: General, Theory and Principles

See also Nos. 1629, 2153.

2227. Banān, Gh. **[Forest management.]** Ministry of Agriculture, Teheran. 1957. pp. 14 + 423 + 1 map, 1 tbl. 34 refs. [Per.]

A textbook for University students.

2228. Anderson, M. L. **Imminent management problems in Scottish forestry**. *Irish For.* 16 (2), 1959 (35–47).

Paper read to the Society of Irish Foresters, March 1959.

62. Working Plans. Annual or Periodic Yield. Yield Regulation

2229. Tregubov, V. Rapport provisoire au gouvernement de l'Iran sur la métode d'aménagement expéditive des forêts du Nord de l'Iran. **[Provisional report to the Government of Iran on a speedy [simplified] method of management for the forests of N. Iran.]** FAO, Rome. No. *FAO*/59/8/6250, 1959. pp. 26. [F.] Limited distribution.

Considers that simplified working plans are both necessary and feasible and makes recommendations.

64. Forestry as a Business: General

2230. Vorträge von der Forstökonomischen Arbeitstagung in Eberswalde 1 bis 5 Juli 1958. **[Papers read at the meeting on forest economics at Eberswalde 1-5 July 1958.]** *Suppl.* to *Forst u. Jagd* 9 (11), 1959. pp. 19. 11 refs. [G.]

Contains the following papers: The influence of the degree of economic development on the assessment of the results of forestry (*J. Čapek*); The planned economic organization of the Rogow experimental forest with special regard to the financial assessment of results (*R. Fromer*); Problems of planning and assessment of results in E. Germany (*E. Melzer*); The economic basis of [forest] management in Poland (*T. Molenda*); The gap between increment and utilization, a serious problem of the Czechoslovakian economy (*V. Sprock*); and Productivity of labour; what it means and how it can be improved, and measured (*H. Jeuthe*).

2231. Miraboğlu, M. Türkiye devlet orman işletmelerinin işletme iktisadi bakimindan tetkiki. **[An economic investigation of the Turkish State Forests.]** *Istanbul Üniv. Yay.* No. 763 (*Orm. Fak.* No. 56), 1958. pp. 196. 165 refs. [Turk.g.]

After a general account of the economics and history of Turkish forests and the present condition of the State Forests, the author gives an account of economics of the State Forests, covering physical assets (land, stocking, fixed capital, etc.) and financial liabilities (working capital, creditors, etc.) He classifies these forests in 4 groups, viz. those forests which (1) always, and (2) usually, show a profit, and (3) usually, and (4) always, show a loss.

2232. Streyffert, T. Skogsbruket och den tekniska utvecklingen. **[Forestry and technical progress.]** *Svenska SkogsvFören. Tidskr.* 57 (3), 1959 (499–507). [Sw.]

Chiefly an economic analysis, suggesting *inter alia* that the increase in productivity through mechanization of logging etc. has to a large extent been absorbed by higher real earnings of forest workers (nearly twice their value in the 1930s).

2233. Heikinheimo, L. Om inkomstfördelning (prisbildning) i kombinationen skogsbruk og skogindustri. **[The distribution of income (price determination) in the combination of forestry and the forest industries.]** *Norrlands SkogsvFörb. Tidskr.* 1959 (3), (241–51). 3 refs. [Sw.]

Presents diagrams showing the relations between costs of felling (a), transport (t), and mill conversion (f) and the price paid for standing timber (r), assuming that the export price remains constant. Increasing distance from forest to mill has no effect on a or f but causes an increase in t with a corresponding decrease in r, to a point o where $r = 0$. Diagrams show variations in the relation of r to t or in the relative distance of o from the mill, e.g. when a increases as a result of increased wages, when t is reduced as a result of technical improvements, or when the export price increases. In Finland, in spite of increasing forest wages, r represented ca. 50% of the cost of raw materials at the sawmill in both the 1920s and the 1950s, rising to 70% in the 1930s and dropping to 30% in the 1940s. In countries where forests are largely state-owned, e.g. Canada and the U.S.S.R., it is not necessary that r should have a positive value for every unit of timber delivered, provided that the mean value is positive.

2234. Kano, G., Koseki, T., and Shimotori, S. **[The important role of forestry in the economy of farmers living near the forests or in the mountain village. I.]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (2), 1959 (405–69). [Jap.e.]

A study was made of 3 communities, to determine the importance of forestry income; amount of working time spent in forestry; relative value of timber, charcoal, grazing and grass cutting in the forest.

2235. Kano, G., Koseki, T., and Shimotori, S. **[Investigation on the actual state of intimate connection of agriculture and forestry in farm management, especially in the newly developed land in Hokkaido. (VI). Colligation.]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (2), 1959 (471–509). [Jap.e.]

A study was made of 63 farms in order to determine the degree to which forest utilization is contributing to farm management in newly developed land.

2236. Delisle, R. Rôle économique, assiette, et étendue du boisé de ferme. **[The economic function, location, and extent of the farm woodland.]**

Forest Service, Department of Lands and Forests, Quebec. 1959. pp. 46. [F.]

An information bulletin, with particular reference to Quebec province.

2237. Delisle, R. La ferme et ses parties. **[The farm and its constituent parts.]** Forest Service, Department of Lands and Forests, Quebec. 1959. pp. 9. [F.]

Discusses the lay-out of a typical Quebec farm including the location of Maple grove and woodlot.

2238. Bourdo, E. A., Jr., and Johnson, J. A. **Practical small woodland management**. *Tech. Bull. Ford For. Cent., L'Anse* No. 1, 1959. pp. 7 + plan.

A small-scale experiment in costing for the owner of a farm woodland harvesting the timber himself, showed that he could realize net earnings of as much as $2.47/hr. while practising good forestry.

2239. Gibbs, C. B. **Managing a small forest in East Texas.** *Occ. Pap. Sth. For. Exp. Sta.* No. 163, 1958. pp. 7.

On a 67-acre study area of mixed Pines and hardwoods, managed for 10 years (two cutting cycles), ca. 93,000 bd. ft. of Pine, plus considerable amounts of cordwood, posts, hardwood timber and sleepers had been cut, resulting in a 10% increase in standing volume of Pine and a net yield of $3.20/acre.

2240. Chatelain, F. Taux de placement à utiliser en futaie jardinée résineuse. Application au calcul des valeurs d'avenir et des dommages-interêts. **[Rates of interest to be used in coniferous selection forest. Application to the calculation of future values and damages.]** *Rev. for. franç.* 11 (10), 1959 (672–8). 4 refs. [F.]

65. Special Business Problems of Timber-Growing. Calculation of Costs and Profitability. Valuation

See also Nos. 1621, 1781, 1788, 2034, 2036, 2233, 2240, 2504.

2241. Dutilloy, P. La rentabilité forestière. **[The profitability of forestry.]** *Rev. for. franç.* 11 (10), 1959 (649–60). [F.]

Discusses and explains a method of calculating profitability in which expenditure and receipts are broken down into (*a*) annual, (*b*) occasional, and these in turn are distinguished as (1) 'not deducted' [those that will appear in the calculations] and (2) 'deducted' [those that are added or deducted before the calculation]. Expenditure is distinguished as investment, direct, and indirect, and receipts as principal (from thinnings, fellings), accessory (hunting, quarries, minor forest products), and final value of investments (soil, final stand). Examples are given.

2242. Opheim, T. Omdriftsberegninger i østnorsk granskog. **[Calculating rotation in eastern Norwegian Spruce forest.]** *Norsk Skogbr.* 4 (18), 1959 (483–6). 4 refs. [Nor.]

Presents graphs showing the net profit (defined as the stand's net value increment minus the interest on the sale value and soil value) in Kr./ha. for varying b.a. and tree heights on site classes A–E and at interests of 3 and 4%, assuming a price of Kr. 100/cu. m. and a volume cost (that part of the cost that varies with the volume) of Kr. 40/cu. m.; graphs showing the indicating % for each site class; and examples showing the use of these graphs to determine whether a stand is mature for felling.

2243. Pisarenko, A. I. Ėkonomičeskaja ocenka osnovnyh sposobov stepnogo lesorazvedenija. **[An economic assessment of the basic methods of steppe afforestation.]** *Lesn. Hoz.* 11 (11), 1958 (49–53). 1 ref. [Russ.]

Tabulates costs of different common methods of tillage, sowing and planting, and weeding, individually and for different combinations of these methods, in the steppe zone of the U.S.S.R.

2244. Soest, J. van. Economische aspecten van de douglasteelt. **[Economic aspects of growing Douglas Fir.]** *Ned. Bosb. Tijdschr.* 31 (10), 1959 (269–84). 20 refs. [Du.du.e.]

Presents figures showing the % distribution by age class of Douglas Fir, Scots Pine and other conifers in the Netherlands, distribution of Douglas Fir and Scots Pine by growth [site quality] and production classes within the most important site types (podzolic, old farm land, loamy and non-loamy forest land, blown sand etc.) and their capital value by production class and site type. Discusses the profitability of Douglas Fir (costs and timber prices), markets, production of trees suitable for sawtimber, exploitation and conversion, and length of rotation, concluding that the increasing cultivation of the species in the Netherlands is economically justified. [Cf. *F.A.* 20 No. 899.]

2245. Sasse, O. Ergebnisse der Fräsenbuchführung Fwj. 1958 im Regierungsbezirk Lüneburg. **[Results of cost accounting for rotary cultivator work in the forestry year 1958 in the Lüneburg administrative region.]** *Forst- u. Holzw.* 14 (19), 1959 (418–20). [G.g.]

[Cf. *F.A.* 20 No. 2205.] Light machines (⩽ 7 h.p.) cost DM 6.08/working hour, and heavy machines (> 9 h.p.) DM 7.54.

2246. Coulon, M. de. Résineux et feuillus. **[Softwoods and hardwoods.]** *Forêt, Neuchâtel* 13 (1), 1959 (2–10). [F.]

Analyses volume and value of yield and increment in a fairly representative mixed selection forest in the Swiss Jura during the period 1950–57. The mean %s of sawtimber for all diameter classes were 60 for Spruce and Silver Fir against 30 for Beech and Oak, with a further 25% pulpwood for the former and nil for the latter, resulting in mean value/cu. m. of Fr. 57 for softwoods, Fr. 28 for Beech, and Fr. 36 for Oak. Though the p.a.i. was greatest for Beech of all diameter classes, value increment was greatest for the softwoods throughout, hardwoods approaching equality in the largest diameter classes only, the p.a.i. of Oak being worth about half that of Spruce.

66. Costing of Logging Operations

See Nos. 1847, 1857, 1893, 2233.

2247. Benić, R. Analiza troškova i kalkulacije ekonomičnosti u iskorištavanju šuma. **[Cost**

analysis and calculation of economy in timber harvesting.] Stručno udruženje šumsko-privrednih organizacija Hrvatske, Zagreb. 1957. pp. 73. 12 refs. [Croat.]

A handbook for specialists employed in timber harvesting in Jugoslavia. Discusses general considerations of economy in an enterprise, gives a classification of basic costs, and the principal methods of cost analysis and determination of unit costs. These principles are applied to harvesting problems: the most economic location and spacing of roads and landings, and selection of the most economic methods of felling, skidding, transport and storage of wood. The data are contained in tables and graphs.

2248. Nutzen und Pflege des Bergwaldes. Holzen im Bergwald. **[Utilization and care of mountain forests. Extraction.]** *Alpwirtschaftliche Monatsblätter, Bern* 92 (6), 1958 (181–99). [G.] A.P.B.

Argues, with computations and examples taken partly from actual development schemes, that, compared to skyline cranes, road-building in mountain forests is wasteful of forest land, potentially injurious by encouraging ground skidding, and excessively costly in capital and maintenance. A skyline system with a length of 3000 m., capable of extracting all wood felled annually in an area of 1200 ha. with an annual cut of 3·5 cu. m./ha. would cost Fr. 48,000 (Fr. 58,000 with permanent concrete cable-anchorages), while a network of roads spaced ca. 300 m. apart would cost Fr. 3,000,000. Combined schemes, involving shorter skylines but more supports etc., are considered even less economical, though agricultural roads could be used to advantage. [Cf. *F.A.* 19 No. 2196.]

2249. SUNDBERG, U. Om bilvägar och produktivitet i skogsbruket. **[Lorry roads and productivity in forestry.]** *Svenska SkogsvFören. Tidskr.* 57 (3), 1959 (509–14). 3 refs. [Sw.]

The author discusses from a theoretical model based on his formulae [cf. *F.A.* 17 No. 1644], the effect of management systems on transport costs (skidding to road and road maintenance) assuming two extremes: (*a*) an exploitative system, i.e. concentrated fellings once in a rotation with little or no silviculture, assumed to yield 1·8 cu. m./ha., and (*b*) a continuous system with dispersed fellings, removing each year a volume roughly equal to the increment put on by that area of forest, with intensive silviculture, and an assumed yield of 4 cu.m./ha. The computations indicate that capital requirements and transport costs per cu. m. are so much greater in (*b*) than in (*a*) that they should form an important factor in deciding what system should be adopted, a further important factor being the provision of continuous work and adequate communications for the local population.

67. Assessment of Financial Results: Book-keeping and Accountancy; Business Statistics; Short-Term Planning and Financing

2250. BENTZ, F. Die Ertragslage in der Forstwirtschaft in den letzten zehn Jahren. **[Profitability in [Austrian] forestry in the last ten years.]** *Holz-Kurier, Wien* 14 (50), 1959 (1–2, 3). [G.]

Presents summary data for the period 1951–59 based on records of a medium estate in Upper Austria, showing a steady rise in direct and indirect costs, while prices rose less than costs or declined since 1956, and are now about equal. Reasons, remedies and the inevitable choice between the evils of overfelling and neglecting maintenance and reforestation are discussed.

68. Administration and Organization of Forest Enterprises

681. National (Federal, State) Forest Services and Administration

See Nos. 2574–5, 2587.

686. Planning and Organization of Buildings, Transport Installations (Roads etc.)

See Nos. 2226, 2247–9.

7. MARKETING. ECONOMICS OF TRANSPORT AND THE FOREST PRODUCTS INDUSTRIES

See also No. 2262.

2251. **Forest products.** Barclays Bank D.C.O., London. 1959. pp. 171. 7 refs.

A general survey under the following main heads: Forest areas (distribution and types of forest in climatic zones); The tree, softwood and hardwood types and distribution; Resources and developments (i.e. of the world); The timber industry (i.e. forest operations and timber conversion); Pulp products and other utilization; Pest control; Promotion of forestry and forest products; Marketing of timber; Roundwood removals and output of forest products; World exports and imports and trade in forest products and timber (sawn wood and logs); Minor forest products (gum arabic, chicle, cork, etc.). A glossary of trade technical terms and 11 coloured plates of timber surfaces are included.

2252. REIERSEN, N. **Reiersen's timber manual.** AB Svensk Trävaru-Tidning, Stockholm. 1959. pp. 320. [E.] Transl. by R. Grugeon from the 7th ed. (revised and supplemented by T. Bæckström and R. Martin). Price [£2. 10*s*.]

A textbook for the Swedish export trade, first published in Sweden in 1897, including sections on logging, measuring and sorting sawlogs, floating, round timber assortments, square-hewn and square-sawn timbers, sawing and seasoning, sorting, sawn timber assortments and export prices, resawing and planing, planed goods, plywood, fibre boards, wood quality, selling, chartering, delivery etc., arbitration, marine insurance, shipping, measuring and calculating, and forest laws, with a list of trade terms (English, Swedish, French and German), many reference tables, etc.

72. The Quantitative Aspects of Marketing. Demand, Consumption and Supply

See also No. 2406.

2253. **Statistics on tropical timber 1957. Imports by O.E.E.C. member countries. Production and exports by overseas territories.** Organisation for European Economic Co-operation, Paris. 1959. pp. 92. [E.F.] Price 6*s*.

2254. MAYER-WEGELIN, H. Die gegenwärtige Entwicklung der Holzverwendung. **[Modern trends in the use of wood.]** *Forst- u. Holzw.* 14 (22), 1959 (469–73). [G.]

Discusses trends in German *per capita* consumption of wood, changes in wood supplies (home production, imports and exports), changes in the proportions of the main assortments, and trends in wood consumption by the main branches of the wood-using industry. It is concluded that wood is being replaced in many widely differing sectors by competitive materials, and that the full seriousness of the position will become evident in a few years' time. The blame for this state of affairs is put largely on the price policy and inaction of German forestry. Energetic and forward-looking marketing policies are urged as being of vital importance.

2255. SEKI, M. **Japanese view on log trade with N.Z.** *N.Z. Timb. J.* 6 (3), 1959 (44–6).

Discusses the scope for imports of New Zealand-grown *Pinus radiata* into Japan, the merits and demerits of the wood from the Japanese point of view, and the crucial factor of price relative to Siberian logs and home-grown Pines. With this reservation of price, the outlook for the Japanese market for Radiata Pine is reasonably good.

2256. HANSON, A. B. **Australia's future requirements of forest products.** *Aust. For.* 23 (1), 1959 (38–45). 6 refs.

2257. TURNBULL, R. F. **Future requirements for forest products in Australia.** *Aust. For.* 23 (1), 1959 (24–37).

73. Prices

See also No. 2233.

2258. RIIHINEN, P. Laskelmia eräiden puutavaralajien hintojen pitkäjänteisestä kehityksestä. **[The long-term price trends of certain timber assortments.]** *Metsät. Aikak.* 1959 (8), (270–3). 4 refs. [Fi.e.]

Calculations refer to Finland as a whole. The price series studied were adjusted to changes in the purchasing power of the Finnmark. Serial correlation analysis (the mean-square successive-difference method) was then employed to detect the existence or absence of a trend. The conclusion was that the rise over the period 1913–53, both of export prices of sawn timber and of stumpage prices of sawlogs, had been highly significant. The least-square regression lines that were fitted to these series, which represent very different variations, suggested equal average price increases over the 40 years studied. A further check, using data from other sources and covering the period 1935–55, led to the same conclusion. The prices of Spruce pulpwood and industrial Pine cordwood, however, did not exhibit a trend significantly different from a horizontal line.

2259. SCHEISTRØEN, A. Kvalitetsbetaling for tømmer. **[Quality payment for wood.]** *Norsk Skogind.* 13 (11), 1959 (383–90). 10 refs. [Nor.nor.] P.R.

Stresses the different requirements of the sawmill and pulp industries and the need to recognize this fact in price assessments. Proposes a new price scale for Spruce logs when mid-diameter is measured, allowing for the facts that, with decreasing amounts of taper, (1) mid-diameter generally decreases and (2) pulp yield per cu. m. [cf. *F.A.* 7 No. 1893] increases; the new scale would therefore be calculated on the basis of increasing cu. m. price with decreasing mid-diameter. An example of such a scale is given. A study of the basic prices for Spruce, in which top-diameter is measured, shows that the increase in price per cu. m. with increasing top diameter is too steep in relation to the pulp industry's requirements.

78. Economics of Transport

See Nos. 1895, 2233, 2411.

79. Economics of the Forest Products Industries

See also Nos. 2411, 2521–3, 2534, 2576, 2579, 2587–9.

2260. VUJIČIĆ, L. Sirovinska baza i stanovništvo kao činioci razvoja drvne industrije u Jugoslaviji. **[Raw materials and population as factors in the development of the wood industry in Jugoslavia.]** *Drvna Ind.* 10 (9/10), 1959 (136–47). 19 refs. [Croat.f.] P.R.

Analyses firstly the forested area, annual cut, number of workers in the wood industry, and the industrial capacity, for each of the six republics in Jugoslavia, and then the population of the country in relation to markets. It is concluded that in Macedonia, Serbia and Montenegro the forests are under-exploited and the wood industry is insufficiently developed. Population factors as well as considerations of raw materials must be taken into account when investments are being considered.

8. FOREST PRODUCTS AND THEIR UTILIZATION

See also Nos. 2251–2.

2261. BOLZA, E. **German-English glossary of forest products terms.** Division of Forest Products, C.S.I.R.O., South Melbourne. 1959. pp. 169.

The glossary, which is arranged alphabetically, also contains many silvicultural and utilization terms.

2262. Ciclo de conferencias sobre maderas y sus aplicaciones. XXIV Congreso Luso-español para el Progreso de las Ciencias. **[Series of papers on wood and its uses [given at] the 24th Portuguese-Spanish Congress for the Advancement of Science [14-20 Nov. 1958].]** Servicio de la Madera, Ministerios de Industria y Agricultura, Madrid. 1959. pp. 98. [Span. or Port.]

Contains the following papers: Present and future of wood both as raw material and manufactured, as a result of technical and industrial progress (*F. Nájera*); The national outlook for timber and the woodworking industry in relation to supply and regulation of markets (*A. Bernad*); The present state of wood-waste utilization in the timber industry (*H. Santiago Burgos*); Evolution and history of wood anatomy (*M. P. Ferreirinha*); The regulation of the timber market (*A. Sáez de Montagut*); The importance of glued wood products in the national economy (*C. Peraza Oramas*); Features of national afforestation in relation to the future supply of markets (*J. Luque*).

2263. MATHUR, G. C. **Symposium on timber and allied products—a report**. *Indian For.* 85 (10), 1959 (607–15).

Gives an account of the symposium (organized by the National Buildings Organization and held at New Delhi in May 1959), summarizes its recommendations, and lists the 54 papers presented.

810. General Information on Woods

See also Nos. 1514, 1654, 1664, 2422.

2264. MOSKALEVA, V. E. Stroenie i fiziko-mehaničeskie svojstva drevesiny daurskoj listvennicy. **[The structure, and physical and mechanical properties of *Larix gmelinii* wood.]** *Trud. Inst. Les.* No. 45, 1958 (136–44). 20 refs. [Russ.]

Describes and illustrates the wood structure, and tabulates full details of the physical and mechanical properties of *L. gmelinii* from Yakutia, comparing them with those of *L. sibirica*.

2265. **[Outline of important Japanese wood: *Podocarpus macrophyllus* D. Don.]** *Suppl.* to *Wood Ind., Tokyo* 14 (10), 1959. pp. 2. [Jap.] P.R.

Includes photomicrographs and tabulated data on wood properties.

2266. **Specimen Woods Nos. 285-288.** *Suppls.* to *Wood* 24 (9–12), 1959. Each pp. 2.

Munyankono (*Strombosia scheffleri*); Hoop Pine (*Araucaria cunninghamii*); Mukusu (*Lovoa swynnertonii*); and African Satinwood (*Fagara macrophylla*).

2267. ARKWRIGHT, P. **Know your timber: Nos. 66-67.** *Woodwkg. Ind.* 16 (10; 12), 1959 (549; 705). P.R.

Makoré [*Mimusops* (*Dumoria*) *heckelii*]; and Prima Vera [*Tabebuia donnell-smithii*].

2268. LAMB, G. N. **Foreign woods. Berlinia. *Berlinia* sp. Viraro. *Pterogyne nitens*.** *Wood, Chicago* 64 (10), 1959 (66). P.R.

2269. WILLIAMS, E. **Uses of some common imported species.** *Tech. Notes For. Comm.* (*Div. Wood Technol.*) *N.S.W.* 11 (3), 1958 (11–2).

Gives some properties and uses of 8 species from various Pacific Islands and Malaya, viz. *Octomeles sumatrana*, *Ficus* spp., *Artocarpus* spp., *Gonystylus warburgianus*, *Alstonia scholaris*, *Dyera costulata*, *Celtis* spp., and *Endospermum* spp.

2270. Drei nordamerikanische Spezialhölzer. Maple—Persimmon—Red Gum. **[Three North American timber specialities: *Acer saccharum*, *Diospyros virginiana*, *Liquidambar styraciflua*.]** *Holz-Zbl.* 85 (120), 1959 (1705–6). 9 refs. [G.]

Distribution, description of the trees and the wood, properties and uses.

2271. BETTS, H. S. **Oaks (Eastern): (*Quercus* spp.)** *Amer. Woods U.S. For. Serv.* (rev.) 1959. pp. 24. 14 refs. Price $0.15.

2272. **Properties of Australian timbers: Brush Box (*Tristania conferta*).** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 251, 1959 (4). P.R.

Covers habitat and distribution, timber properties, seasoning, working qualities, and uses and availability.

2273. **Properties of Australian timbers: Manna Gum [*Eucalyptus viminalis*].** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 253, 1959 (4).

Covers habitat and distribution, appearance and physical properties of the timber, working and seasoning properties, and uses and availability.

2274. **Properties of Australian timbers: Grey Gum.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 256, 1959 (8).

Covers habitat and distribution, timber properties, seasoning, uses, and availability of a small group of Eucalypts, the most common species of which are *Eucalyptus propinqua*, *E. punctata*, and *E. major*.

2275. **Properties of Australian timbers: Sidney Blue Gum [*Eucalyptus saligna*].** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 256, 1959 (7).

Covers habitat and distribution, timber properties, seasoning, uses, and commercial availability of the tree.

2276. **Properties of Australian timbers: Red Mahogany.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 257, 1959 (4).

Red Mahogany is the standard trade name for

Eucalyptus resinifera, but small amounts of the closely related woods of *E. pellita*, *E. kirtoniana* and *E. notabilis* are sold under the same name.

811. Structure, Identification

See also Nos. 1406, 2262, 2451, 2505–6.

2277. **List of publications on the growth, structure and identification of wood**. *Rep. U.S. For. Prod. Lab., Madison* No. 177, 1959. pp. 31.

The references (mainly to U.S. works) are grouped under: General and miscellaneous; Structure and identification; Relation of wood structure to its properties and uses; Relation of growth conditions to wood quality; Technique; and Some books about wood. Instructions for obtaining publications are given.

2278. JEWELL, F. F. **Softening Slash Pine tissues for serial sectioning**. *Stain Technology, Baltimore* 33 (4), 1958 (191–2). 5 refs. O.R.S.

Tissuemat blocks, cut on one side to expose the embedded material, were placed in small open containers, covered with a 10% aqueous solution of glycerol, kept in an oven at 35–37° C. for 24 hr. and then sectioned. Extending the softening to 48 hr. gave no advantage. Soaking at room temperature slowed down penetration. The method gave uniform results with primary and cotyledonary needle tissue, 5-month-old stem tissue and stem material from mature trees in pieces up to 1·5 × 1·5 × 0·5 cm. Longitudinal and transverse sections of wood cut 8–12 μ thick seemed best.

2279. FOLLIERI, M. Nuovo metodo per la preparazione di legni fossili pietrificati. **[A new method for preparing [specimens of] petrified fossil woods [for microscopical examination].]** *Nuovo G. bot. ital. (n.s.)* 65 (4), 1958 (1959), (869–71). 8 refs. [It.it.e.] A.P.B.

2280. CARLQUIST, S. **Wood anatomy of Helenieae (Compositae)**. *Trop. Woods* No. 111, 1959 (19–39 + 4 plates). 11 refs.

Describes and discusses the anatomy of the 15 woody species of Helenieae, with a tabular key to anatomical characters.

811.1 Anatomical Elements and Tissues

See also Nos. 1421–3, 1433, 2005, 2316, 2321–2, 2343, 2345, 2348, 2439–41.

2281. SCHNIEWIND, A. P. **Transverse anisotropy of wood a function of gross anatomic structure**. *For. Prod. J.* 9 (10), 1959 (350–9). 21 refs.

Theoretical equations are developed for elasticity, tensile strength and shrinkage in the radial and tangential directions, as functions of the separate values of rays and prosenchyma (here taken as all cells except ray cells) and of early and late wood respectively, regarding the whole wood as a complex laminate of its anatomical components [c.f. *F.A.* 20 No. 3698]. The values measured for the whole wood of *Quercus kelloggii* agreed well, in general, with those computed by introducing values for its anatomical components and their proportions into the equations (techniques of measurement described), particularly in the green state. The greater elasticity and strength in the radial than in the tangential direction was entirely, and the lesser shrinkage chiefly, attributable to the properties of the rays, which more than offset the differences (tending to reduce radial strength values) between early and late wood.

2282. JAYME, G., and HUNGER, G. Über Elektronenbilder gequollener Tracheiden und die Sichtbarmachung von Längsstrukturen auf der Faser. **[Electron microscope photographs of swollen tracheids, and making longitudinal structures visible on the fibre.]** *Holz Roh- u. Werkstoff* 17 (2), 1959 (41–4). 13 refs. [G.g.e.] P.R.

A method was developed for taking electronographs of swollen tracheids in Spruce sulphite and sulphate pulp. The fibre edges, being rich in lignin, swell less than the walls, this being the reason for the longitudinal structures. Electron microscopy of the swollen fibres frequently shows axially running bundles of microfibrils which are probably part of the primary wall or form a transition between primary and outer secondary wall, and which probably developed near former fibre edges. Celluloses swollen in H_3PO_4 and then treated with water, show parallel-lying structures probably developed from a recombination of cellulose chains. *From authors' summary.*

2283. WARDROP, A. B., LIESE, W., and DAVIES, G. W. **The nature of the wart structure in conifer tracheids**. *Holzforschung, Berlin* 13 (4), 1959 (115–20). 15 refs. [E.e.g.] P.R.

The development and morphology of the wart structure [cf. *F.A.* 19 No. 909] was studied in fresh and air-dry *Pinus radiata*, *Callitris glauca* and *Actinostrobus pyramidalis*, with particular reference to *A. pyramidalis*, in which it is particularly well developed. The wart structure is formed in the concluding stages of differentiation, when lignification is complete or nearly so. A method was found by which the wart structure could be isolated, and its solubility and staining reactions were studied. In *Actinostrobus*, the wart structure consisted of a membrane lining the cell lumen from which a number of diverticula or pouches protrude into the lumen. Within the diverticula are small spherical bodies 0·1–0·5 μ in diameter. The membrane did not absorb in the ultra-violet region, but the spherical bodies showed strong absorption. The wart structure is considered to be quite distinct from the secondary wall. [Cf. *F.A.* 21 No. 926.] *From authors' summary.*

2284. JAYME, G., and FENGEL, D. Untersuchungen über den Feinbau der Hoftüpfelschliesshäute in Fichtenholz unter Anwendung einer Feucht-Präparationsmethode. **[Investigations on the fine structure of bordered pit membranes in Spruce, using a moist method of preparation.]** *Holz Roh- u. Werkstoff* 17 (6), 1959 (226–30). 16 refs. [G.g.e.] P.R.

Presents and discusses electron-microscope photographs of the microfibrils in the bordered pit membranes of (1) freshly felled, and (2) air-dry Spruce, impressions of which were obtained after soaking in a sorbitol solution. In the sapwood of (1) no connecting threads of the pit membrane were found, but in its heartwood and the sapwood and heartwood of (2) these connecting threads were present—more frequently in (2) than in (1). It is assumed that membranes with connecting threads belong to closed bordered pits, and that connecting threads of microfibrils form only after bordered pits have closed.

2285. BRAUN, H. J. Die Vernetzung der Gefässe bei *Populus*. **[Vessel network in Poplar wood.]** *Zeitschrift für Botanik, Stuttgart* 47 (5), 1959 (421–34). 11 refs. [G.g.e.] O.B.D.

In Poplar, vessels and groups of vessels touch each other longitudinally, forming a common cell-wall provided with bordered pits. In this way a closed network of vessels is formed in both the tangential and radial directions, and both within one growth ring and between successive rings. In the first growth ring this network is relatively open and is of the same density in nearly all directions. In the considerably closer network of the second growth ring the network takes a mainly tangential direction. In the following rings it gradually becomes more open, finally being more open than in the first growth ring, and predominating in the radial direction. Rays in the first growth ring are relatively high, but are lower in the second; from there on, they increase in height, finally becoming higher than in the first growth ring. The connexion between the density and direction of the vessel network and mean ray height is discussed. Low rays allow a relatively close network, especially in the tangential direction, whereas high rays allow only an open network in a uniform or mainly radial direction. *From author's summary.*

2286. LANGE, P. W. **The morphology of hardwood fibres.** *Tappi* 42 (9), 1959 (786–92). 25 refs. P.R.

Reviews the morphology of the woody cell with emphasis on the structure of fibres in hardwoods, and discusses fibre structure and its effect in papermaking.

2287. HO, T.-H., and LIU, I.-Y. **[Variations in fibre-lengths of three-year-old culms of *Pseudosasa amabilis* (McCl.) Keng f.]** *For. Sci., Peking* 1959 (2), (143–54). 9 refs. [Chin.e.]

Gives tabulated data on the variations in the mean fibre lengths, and the distribution of fibre lengths, from investigations on 205 internodes from nine 3-year-old culms.

2288. SCARAMUZZI, G. Variazioni dimensionali delle fibre nel fusto in *Populus × euramericana* cv. 'I 214'. **[Variation in the dimensions of fibres in the stem of *P.* x *canadensis* cv. 'I 214'.]** *Pubbl. Cent. Sper. Agric. For., Roma* 2, 1958 (1959), (87–118 + 1 tbl.). 34 refs. [It.it.e.*e*.]

The following dimensions were studied in three 12-year-old trees: (*a*) fibre length, (*b*) fibre width, (*c*) diameter of fibre lumen, (*d*) wall thickness, (*e*) length/width ratio of fibres, (*f*) ratio of wall thickness to fibre lumen. Remarkable variations were found, particularly in the radial direction, e.g. a maximum deviation of 94% in (*a*) from the innermost to the outermost ring. Within a growth ring, (*a*), (*d*), (*e*) and (*f*) were found to increase from early to late wood, while (*b*) remained constant and (*c*) decreased. In the longitudinal direction, only (*a*) varied regularly in all rings inspected and in all the trees. Mean variations in one tree were analysed statistically and showed a progressive decrease in (*a*), (*b*), (*c*) and (*e*) with increasing height in tree, while (*d*) remained constant and (*f*) increased. Radial variation was roughly the same for all trees and at all levels in the stem for (*a*), (*b*), (*d*), and (*e*), which all showed an increase from the pith towards the bark, with smaller increments or constant values in the outermost ring. The need for care in selecting material for fibre measurements is stressed. [Cf. *F.A.* 17 No. 796.]

2289. NYRÉN, V., and BACK, E. **The ray volume in *Pinus silvestris* stemwood and its distribution between tracheidal and parenchymatous ray cells. The resin in parenchymatous cells and resin canals of conifers. V.** *Svensk PappTidn.* 62 (19), 1959 (681–6). 12 refs. [E.e.sw.g.] P.R.

Measurements were made on photomicrographs of tangential sections of randomized wood samples from 7 trees from lat. 60° N. The mean total ray volume proved to be 3·9% of the total stem wood, multiseriate rays forming 0·3% and radial resin canals 0·05% of the stem wood. Of the total ray volume 45% was tracheidal and 53% parenchymatous, the remainder comprising mainly radial resin canals and radial intercellular channels bordering the ray parenchyma cells. Results of measurements on ray height of uniseriate rays and the % of tracheidal and parenchymatous cells in rays are shown in graphs. The proportion by weight of ray cells plus vertical and other types of parenchyma cells in Pine sulphate pulps was found to be 8%. Data on cell and cell-wall dimensions from earlier studies [see *F.A.* 21 Nos. 932–3] were used in determining the proportion by weight of tracheidal as 70% and of parenchymatous ray cells as 30% of the total ray-cell weight in the pulp. In sulphite pulps the weight fraction of ray parenchyma cells is expected to be higher.

811.2. Special Features and Abnormal Structure

See also Nos. 1826, 1924, 2320, 2509.

2290. NEČESANÝ, V. **Effect of β-indoleacetic acid on the formation of reaction wood.** *Phyton, Buenos Aires* 11, 1958 (117–27). [E.] From *abstr.* in *Chem. Abstr.* 53 (11), 1959 (10391). P.R.

IAA paste produced the expected result when applied to young stems of (*a*) *Pinus sylvestris* and *Abies alba*, but had no observable effect when applied to the lower side of the horizontal branches of (*b*) *Populus alba*, *P. monilifera*, *Fagus sylvatica*, and *Robinia pseudoacacia*; tension wood formed only on the upper side as normally. When IAA was applied to the upper side, the reaction wood did not form in the last growth ring, or only in the second half, in the vicinity of the application; more callus formed in the immediate vicinity of the reaction wood in (*a*) and on the opposite side in treated (*b*). The cambial sap contains higher amounts of stimulators in the lower sides of bent stems in both (*a*) and (*b*), while in the upper sides their concentrations are lower. The presence of combinations of growth stimulators and inhibitors is shown but these are not identified.

2291. Rosso, R. Osservazioni sulla differenziazione del legno di tensione in piante di pioppo nero. **[The differentiation of tension wood in Black Poplar.]** *Nuovo G. bot. ital.* (*n.s.*) 65 (3), 1958 (1959), (592–9). 5 refs. [It.it.e.] A.P.B.

The author studied the differentiation of tension wood from the cambium in artificially bent branches of a young tree of *Populus nigra*, and describes the different stages of anatomical development, with illustrations from photomicrographs.

2292. Vasiljević, S. Raspored i broj smolnih kanala nekih četinara. **[Distribution and number of resin ducts in some conifers.]** *Šumarstvo* 12 (5/6), 1959 (259–67). 7 refs. [Croat.e.*e*.]

Graphs and tabulates the results of analyses of one tree each of *Pinus nigra*, *P. sylvestris*, *P. peuce*, and *Picea omorika*. A definite periodicity was found in the variation of the number of resin ducts with age; for example, in *P. nigra* the number is smaller than usual in every third year from the 30th to the 45th growth rings. In *P. sylvestris*, from the 34th to the 57th rings, the number of resin ducts reaches a peak every 2 and 3 years (i.e. 3–2–3–2). In *P. peuce* this peak occurs between the 15th and 40th rings every 2–5 years, and from the 40th to 56th year every 3–3–4–3–3 years. In *P. omorika* very high numbers of resin ducts were noted in the 94th and 115th rings. The relations between variations in ring width and number of ducts, and the need to take big enough samples to determine numbers of ducts accurately, are discussed.

2293. Sudo, S. **[Contributions to the knowledge on the wood anatomical characteristics of the Japanese hardwoods; I. Occurrence of lysigenous cysts and traumatic intercellular spaces.]** *J. Jap. Wood Res. Soc.* 5 (4), 1959 (150—3). 7 refs. [Jap. e.*e*.] P.R.

Gives explanations and descriptions of lysigenous cysts occurring in the ray tissue of *Rapanea neriifolia* (observed for the first time in a Japanese species), and of newly observed traumatic axial intercellular spaces occurring in *Cedrela chinensis*, *Prunus grayana*, *P. incisa* var. *tomentosa*, *Zanthoxylum ailanthoides*, and *Picrasma quassioides*.

811.4. Growth Rings. Early and Late Wood

See Nos. 1924, 2281, 2369–71, 2511.

811.5. Sapwood and Heartwood

See Nos. 2369–70, 2434.

811.6. Texture, Grain, Figure

See Nos. 1421–3, 2510.

811.7. Phloem; Bark

See also Nos. 1680, 1722, 2010–3.

2294. Shigematsu, Y. **[Studies on the structure of bark. I. On the thickening growth of bark. II. On the relationships between the thickening growth and the microscopic structure of bark.]** *Sci. Rep. Saikyo Univ.* (*Agric.*), *Kyoto* No. 10, 1958 (55–67 + 4 plates). 11 refs. [Jap.jap.e.*e*.]

(I) Measurements of the radius of the wood and bark thickness were made on one tree each of *Cryptomeria japonica* (age 50 years, height 15·2 m., g.b.h. 63 cm.), *Pinus densiflora* (22 years, 10·2 m., 53 cm.), *Quercus acutissima* (33 years, 12·1 m., 43 cm.) and *Prunus serrulata* var. *spontanea* (25 years, 9·1 m., 32 cm.). Both dimensions were in inverse relationship to height in the tree, the curve descending less steeply for bark than for wood. In the two conifers, it is the thickness of the outer bark (o.b.) that varies, that of the inner bark (i.b.) remaining fairly constant at all heights in the tree; in the hardwoods, however, both o.b. and i.b. vary (the latter rather more) with height. In all the trees, variations in sapwood width with height are small compared with those in heartwood width. I.b. thickness expressed as a % of the radius of the tree increases and o.b. thickness decreases with increasing height in the tree. (II) Studies on *C. japonica*, *Pinus densiflora*, and *Prunus serrulata* var. *spontanea* are illustrated with photomicrographs. The microstructure of the bark proved to vary much more than that of the xylem. The size of bark elements varied radially and with height in the tree. In the i.b., tangential growth of the cells of the parenchyma, sieve tubes, rays and phelloderm prevents the cracking, related to increasing tree girth, that occurs in the o.b. where there is no such regular tangential growth. The increase in o.b. thickness in the conifers is due to the growth of "sarajyo" [inner phellem]? tissue, and in *P. serrulata* var. *spontanea* to growth of each tissue [of the phellem?]

2295. Grillos, S. J., and Smith, F. H. **The secondary phloem of Douglas-Fir.** *For. Sci.* 5 (4), 1959 (377–88). 29 refs.

Briefly reviews the literature on the secondary phloem (s.p.) of conifers other than Douglas Fir, and describes detailed investigations of samples of Douglas Fir bark with or without a small amount of adjacent xylem, collected from the boles of trees of various ages (mostly 25–35 years) in Oregon. These indicated that the vascular cambium resumes activity in March, division being most rapid in April–June. Activity continues into August, and occasionally into September in fast growing trees, but ceases in July in slow growing trees. The amount of s.p. produced in each tier varies from 4 elements in suppressed trees to ca. 12 in fast growers. The cortical elements consist of (*a*) sieve cells, which function for parts of two growing seasons, (*b*) phloem parenchyma strands, (*c*) fusiform phloem parenchyma cells, which collapse soon after they are differentiated, and (*d*) vertical albuminous cells that may be associated with (*e*) erect cells of the rays. In the season after they are differentiated, (*d*) and (*e*) collapse when the associated (*a*) cease to function. The remainder of the procumbent ray parenchyma and epithelial cells survive with (*b*) for 20–35 years, after which they may differentiate a deep cork cambium. Trabeculae were observed that traversed both (*a*) and (*c*).

2296. Chattaway, M. M. **The anatomy of bark. VII. Species of *Eugenia* (*sens. lat.*).** *Trop. Woods* No. 111, 1959 (1–14 + 3 plates). 7 refs.

[Cf. *F.A.* 17 Nos. 1942–3.] An examination of the bark of 82 species of *Acmena*, *Cleistocalyx* and *Eugenia* (s.l.) from both New and Old Worlds. Conclusions in *F.A.* 21 No. 919 (i) are reaffirmed, and some unusual details of the fibres of some *Eugenia* A species are described and discussed.

2297. Nayar, S. L., and Bisht, B. S. **The pharmacognosy of the bark of *Ficus glomerata* Roxb.** *J. sci. industr. Res. India* 18*C* (1), 1959 (15–7). 4 refs. P.O.

The macroscopic and microscopic characters of the bark are described with illustrations.

812. Physical and Mechanical Properties

See also Nos. 2505–6, 2557.

2298. Sekhar, A. C., and Bhatnagar, S. S. **Physical and mechanical properties of woods tested at Forest Research Institute. Report V.** *Indian For. Rec.* (*n.s.*) *Timber Mechanics* 1 (6), 1957 (123–35).

Gives tabulated results of tests on *Heritiera* sp., *Kayea floribunda*, *Amoora rohituka*, *Carallia lucida*, *Chikrassia tabularis*, *A. wallichii*, *Cinnamomum iners*, *Bassia butyracea*, *Heterophragma roxburghii*, *Pongamia glabra*, *Saccopetalum tomentosum*, *Terminalia myriocarpa*, *Pentace griffithii*, *Mimusops littoralis*, *Michelia montana*, *M. oblonga*, *Eugenia* spp., *Engelhardtia spicata*, *Pterocarpus santalinus*, and *Dalbergia latifolia*.

2299. Sekhar, A. C., and Bhatia, D. N. **Physical and mechanical properties of woods tested at Forest Research Institute. Report VI.** *Indian For. Rec.* (*n.s.*) *Timber Mechanics* 1 (7), 1957 (137–46).

Gives tabulated results of tests on *Miliusa velutina*, *Quercus lamellosa*, *Q. lineata*, *Castanopsis hystrix*, *Mimusops elengi*, *Stereospermum xylocarpum*, *Vitex altissima*, *Bridelia retusa*, *Calophyllum* sp., and *Dichopsis polyantha*.

2300. Sekhar, A. C., and Bhatnagar, S. S. **Physical and mechanical properties of woods tested at Forest Research Institute. Report VII.** *Indian For. Rec.* (*n.s.*) *Timber Mechanics* 1 (8), 1957 (148–54).

Gives tabulated results of tests on *Lagerstroemia lanceolata*, *Alnus nepalensis*, *Poeciloneuron indicum*, *Stereospermum chelonoides*, *Albizzia odoratissima*, *Podocarpus wallichianus*, *Hardwickia pinnata*, *Balanocarpus utilis*, *Eucalyptus eugenioides*, and *Shorea robusta*.

2301. Ohsawa, M., Ishida, S., and Miyawaki, Y. **[Studies on the properties of Nara-wood, *Quercus* spp. grown in Hokkaido. II. Some physical properties, especially transverse shrinkage, of Mizu-nara-wood, *Q. crispula* Bl., from the headwaters of the River Tokachi in Hokkaido.]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (1), 1959 (53–76). 12 refs. [Jap.e.*e.*] [Cf. *F.A.* 18 No. 1115.]

2302. Greene, S. **An investigation of certain physical and mechanical properties of Lignum-vitae.** *For. Prod. J.* 9 (9), 1959 (303–7). 5 refs.

In tests on heartwood samples of Lignum vitae [*Guaiacum officinale*?] with a mean sp. gr. of 1·21, shear strength was about equal and toughness below that of *Betula lutea* while hardness (the testing of which required a modification of method) was 4 to 5 times as great. Reaction to 11 chemical reagents was tested by 7 days' immersion. 10% NaOH had the greatest effect on weight and dimensions, and reduced abrasion resistance most (to 57% of that of the air-dry specimen) followed, for abrasion resistance, by toluene (68%). Boiling in water for 8 hr., after 6 days' soaking, reduced it to 63%. Sub-zero temperatures hardly affected it. The coefficients of static and kinetic friction, tested on a steel plate, were generally comparable or superior to other low-friction materials used industrially, e.g. Arguto (oil-impregnated Maple) or nylon.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

See also Nos. 1312, 1922, 2368, 2459, 2549.

2303. Onodera, S. **[Colorimetry for wood by a photoelectric spectrophotometer.]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (1), 1959 (183–95). 6 refs. [Jap.jap.e.*e.*]

Measurements were made on samples of *Tilia japonica*, *Kalopanax septemlobum*, *Quercus crispula* and several fibreboards. Differences of 1–2% of the reflection coefficient for *T. japonica* were distinguishable by the naked eye in the range of 4–10% luminosity, but in *Q. crispula* the limit appeared to be ca. 5%. Colorimetric values decreased with increasing weathering, and varied with surface roughness and m.c. of wood.

2304. Atack, D., and Tabor, D. **The friction of wood.** *Repr.* from *Proc. Roy. Soc., Lond.* 246 *A*, 1958 (539–55). 15 refs. P.R.

Experiments were made to study the friction between *Abies balsamea* (on the longitudinal surface of 2 × 2 × ¾-in. freshly cut, straight-grained samples) and surfaces of steel and polytetrafluorethylene (PTFE). The rolling friction (r.f.), essentially the same for steel or PTFE spheres, was found to be due to internal friction or hysteresis losses in the wood and not to surface interaction; as moisture content is raised from 0 to 30%, r.f. increases and then remains constant, apparently because of changes in the mechanical rather than the surface properties of the wood. In contrast, sliding friction (s.f.) apparently depends on the m.c. of the wood and on the chemical nature of the other surface. For steel, s.f. is high whatever the m.c. of the wood, showing that adhesion, probably due to H bonding, is strong in both cases. For PTFE, s.f. is fairly high at low wood m.c., implying a relatively strong adhesion, but it is very low at m.c.'s > 30–40%, showing the importance of surface structure in the adhesion term of friction, in contrast to the deformation term, which is essentially a bulk phenomenon.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 2281, 2301, 2318, 2320, 2368, 2370, 2390, 2414, 2490, 2499–2500, 2511, 2525.

2305. LAUROW, Z. Próba oceny przydatności wywiertkowej metody pobierania próbek do badań wilgotnościowych. **[A trial to assess the suitability of using borers to obtain samples for determination of moisture content.]** *Sylwan* 103 (3), 1959 (19–30). 3 refs. [Pol.russ.e.]

It was found that the m.c. measured from cores obtained by Pressler borer differed by as much as 15% from the actual m.c., owing to (1) errors in measurement, (2) evaporation, (3) squeezing of moisture from the samples. The most important source of error was (3), but the use of borers did allow reasonably accurate m.c. determination for saturation coefficients [actual m.c./max. m.c.] up to 0·6; at higher values, the error increased sharply. Data on wood m.c. calculated from sample cores taken at different seasons should not be compared. [Cf. *F.A.* 21 No. 2317.]

2306. KLEMM, W. Eine neue Methode zur Bestimmung des Holzfeuchteverlaufes in wachsenden Bäumen mit Hilfe von Gammastrahlen. **[A new method of determining the course of moisture-content changes in growing trees by means of γ-rays.]** *Flora, Jena* 147 (3), 1959 (465–70). 6 refs. [G.] O.B.D.

Describes a method based on measurements by γ-rays of the moisture-conditioned changes in density of wood in the living stem. The trials were made on a 4-year-old *Populus* 'Bachelieri' ca. 5 m. high, with a diam. of 7 cm. at the point of measurement, a height of ca. 15 cm. [above ground level?]. Taking the mean dry density of Poplar wood to be $r_o = 0{\cdot}41$ g./c.c., the weight per unit area of dry wood is in this case ca. 3 g./sq. cm., for which, considering the high m.c. of growing trees, a radiation of 137 curies with an energy of 0·66 MeV seemed suitable. A preparation of 1 microcurie activity was installed in a lead container, allowing only a narrow beam to emerge. On the other side of the stem a Geiger counter was set up, connected with measuring and recording instruments. Results of preliminary trials are presented in the form of graphs showing the course of absorption of γ-rays (absorption rising with higher m.c. of the wood) along with accompanying graphs of relative humidity and precipitation. The method proved highly suitable for this kind of measurement.

2307. EDWARDS, N. C. **Brush Box [*Tristania conferta*]: moisture meter corrections.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 255, 1959 (3).

Presents a table of corrected moisture contents for use when testing Brush Box from New South Wales or Queensland, or of unknown origin, with electrical resistance moisture meters calibrated for Douglas Fir.

2308. CHRISTENSEN, G. N., and KELSEY, K. E. **The rate of sorption of water vapour by wood.** *Repr. For. Prod. Aust.* No. 391, 1959. pp. 44. 20 refs.

English text of paper already published in German in *Holz Roh- u. Werkstoff* [see *F.A.* 21 No. 952].

2309. CHRISTENSEN, G. N., and KELSEY, K. E. **The sorption of water vapour by the constituents of wood.** *Repr. For. Prod. Aust.* No. 392, 1959. pp. 34. 31 refs.

English text of paper published in German in *Holz Roh- u. Werkstoff* [see *F.A.* 21 No. 953].

2310. KELSEY, K. E., and CHRISTENSEN, G. N. **The sorption of water vapour by the constituents of wood. II. Heats of sorption. III. The swelling of lignin.** *Repr.* from *Aust. J. appl. Sci.* 10 (3), 1959 (269–93). 27 refs. (*Repr. For. Prod. Aust.* Nos. 379 & 380).

Parts I [see *F.A.* 20 No. 5114], II and III correspond substantially to a paper already published *in toto* in *Holz Roh- u. Werkstoff* [see preceding abstract].

2311. KISHEN, J., GHOSH, D. P., and REHMAN, M. A. **Studies in moisture content, shrinkage, swelling and intersection point of mature *Dendrocalamus strictus* (male Bamboo).** *Indian For. Rec. (n.s.) Wood Seasoning* 1 (2), 1956 (1958), (11–30). 22 refs.

A study was made on mature (> 3 years old) *D. strictus* and it was found that moisture distribution in freshly felled culms was uneven. A more accurate method of determining m.c. is suggested. It was further shown that the shrinkage of Bamboo in the early stages of drying is irreversible and probably due to collapse. The intersection point of *D. strictus* was determined by 3 methods.

2312. OHNUMA, K., and SAITO, H. **[Some aspects of the effect of temperature upon the shrinkage of wood.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 116, 1959 (75–84). 12 refs. [Jap.e.*e.*]

In a detailed study, test specimens of Hinokī (*Chamaecyparis obtusa*) were brought to oven-dryness from green and fibre-saturation point in constant temperatures of 35, 55, 75 and 95° C. The course of moisture loss, total shrinkage, rate of shrinkage per unit time and its ratio to total shrinkage at e.m.c., relation between shrinkage and m.c. and between shrinkage at the surface and at various depths (to 30 mm.) in the specimen are shown in graphs with English captions; also the relation between shrinkage, m.c., stress, and hot pressing (105° C. and 0·3–4·2 kg./sq. cm.).

2313. SAMAPUDDHI, K. **[Shrinkage and swelling in wood.]** *Vanasarn* 17 (3), 1959 (49–52). [Siam.e.]

A general discussion, with emphasis on the equilibrium moisture content, for which, on the basis of meteorological data compiled by the Forest Products Research Division, the optimum values are given for wood users in various parts of Siam, e.g. Eastern Provinces, including Chandaburi, 17% e.m.c.

2314. CAMPBELL, G. S. **Shrinkage in timber during a heat wave.** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 251, 1959 (1–2). P.R.

Examines factors affecting the shrinkage of wood flooring during a period of abnormal heat (very high temperature and very low humidities).

2315. YOUNGS, R. L., and NORRIS, C. B. **New method of calculating internal stresses in wood.** *For. Prod. J.* 9 (10), 1959 (367–71). 8 refs. [Cf. *F.A.* 20 No. 5126.]

2316. BURO, A., and BURO, E.-A. Beitrag zur Kenntnis der Eindringwege für Flüssigkeiten in Kiefernholz. **[The routes by which liquids penetrate into wood of *Pinus sylvestris*.]** *Holzforschung, Berlin* 13 (3), 1959 (71–7). 12 refs. [G.g.e.] P.R.

Microscopic investigations showed that fluids penetrated axially via the bordered pits of the tracheids and the resin ducts. In sapwood, there was no significant difference between the permeability of early and late wood. In heartwood, late wood was impermeable to water and molten paraffin wax, while both liquids could penetrate at least a little into the early wood. The axial and radial resin canals of the sapwood were permeable to water but not to paraffin wax, while in the heartwood they were impermeable to both liquids. In the sapwood the liquids could also pass radially through the ray tracheids. The parenchymatous ray cells could not conduct a liquid radially. The intercellular spaces of the rays were of only local importance in distributing liquids in the wood. Not only the position of the torus but also deposits in the cells had considerable influence on the permeability of the tracheids. *From authors' summary.*

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 2369–73, 2414.

2317. ERICSON, B. **A mercury immersion method for determining the wood density of increment core sections.** *Rapp. Avd. Skogsprod. SkogsforsknInst., Stockh.* No. 1, 1959. pp. 31. 21 refs. [E.e.]

Describes, with illustrations, techniques for sectional determination of core density and for determining mean density of stem cross-sections from the core densities obtained. [Cf. *F.A.* 21 No. 2305.]

812.7. Strength Properties

See also Nos. 2281, 2365, 2371, 2384, 2412–4, 2417–9, 2422, 2428, 2455, 2457, 2459, 2473.

2318. LEONT′EV, N. L. Pročnost′ syroj drevesiny. **[The strength of green wood.]** *Derev. Prom.* 8 (10), 1959 (9). 2 refs. [Russ.] P.R.

Tabulates coefficients that allow calculation of (*a*) compression ||, (*b*) static bending, and (*c*) shear (radial, tangential, and their mean) strength of green wood from known strengths of dry (15% m.c.) wood. Species for which coefficients are given include Ash, Aspen, Beech, Birch, Common Alder, Elm, Silver Fir, Hornbeam, Larch, Lime, Maple, Oak, Pine, Poplar, Spruce, Walnut and Willow. The coefficients increase (in accordance with the systematic position of the species) in the following order: coniferous, diffuse-porous and ring-porous species in (*a*) and (*b*); and diffuse-porous, coniferous and ring-porous species in (*c*). In every case, the coefficient is < 1, i.e. the green strengths are all lower than the dry ones.

2319. RYAN, A. **The mechanical properties of Klinki [*Araucaria klinkii*] and Parana [*A. angustifolia*] Pines.** *Div. For. Prod. technol. Pap. For. Prod. Aust.* No. 5, 1959. pp. 16. 12 refs.

Presents comparative test results, *A. angustifolia* being compared also with *A. cunninghamii* and *A. bidwillii*.

2320. SCHNIEWIND, A. P., and BRYAN, E. L. **Some strength and related properties of California White Oak [*Quercus lobata*].** *Calif. For. & For. Prod. Calif. For. Prod. Lab.* No. 13, 1959. pp. 5. 7 refs.

Covers seasoning, shrinkage, and tension wood, as well as strength properties (tabulated).

2321. IVANOV, JU. M. **[Elastic deformation of wood.]** *Kollojdnyj Žurnal* 19, 1957 (293–8). [Russ.] From *abstr.* in *Holzforschung, Berlin* 13 (4), 1959 (124–5). [G.] P.R.

[Cf. *F.A.* 15 No. 4072.] Pressures of 215–260 kg./sq. cm. were applied to Beech, Oak and Larch, || to the grain, at 15–40° C., the wood m.c. being above the fibre saturation point. Considerable deformations were observed, amounting to 5–10% of the original length of the test piece. It is shown that these deformations are reversible, and possess the typical features of a highly elastic deformation of polymers, as regards both relaxation and a thermo-reversible residual deformation. It is suggested that this elastic deformation depends upon the change of the cellulose in the secondary wall from its original condition into a form with more mobile chains of cellulose.

2322. KOLLMANN, F. Zeit und Festigkeit. **[Time and [its effect on] strength.]** *Holz-Zbl.* 85 (139/140), 1959 (1867–9). [G.]

A theoretical discussion of the mechanics of repeated or prolonged stresses, particularly in relation to the complex micro-structure (part crystalline, part amorphous) of wood, with examples (many of which refer to tests on Ash) taken from published sources [no bibliographical references].

2323. LEE, I. D. G. **Measuring the elasticity of timber.** *Repr.* from *Civil Engineering, London* May, 1959 (12–6). 9 refs.

Lists static and dynamic methods for measuring elastic moduli (Young's modulus and the rigidity (shear) modulus), with special reference to plywood (5-ply Beech and 3-ply Birch) and nailed boarded panels. It is suggested that dynamic measurements provide an almost instantaneous loading method, from which elastic constants relating to the instantaneous elastic deformation may be obtained. The more usual static measurements introduce time-dependent functions which result in creep or inelastic deformation liable to mask true elastic behaviour.

2324. SAWADA, M., and ISHIKAWA, T. **[Rigidity modulus of wood.]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (1), 1959 (153–73). 12 refs. [Jap.e.*e.*]

Torsion experiments were made to test the modulus of rigidity of *Cryptomeria japonica* and *Picea glehnii*. The apparatus and methods used are discussed in some detail.

2325. ŁAWNICZAK, M. Reologia drewna. **[Rheology of wood.]** *Sylwan* 103 (10), 1959 (41–6). 11 refs. [Pol.]

A short review, mainly of British, U.S., and Soviet work.

2326. BOOTH, L. G., and SILVESTER, F. D. **Static bending tests on Scottish grown European Larch in structural sizes.** *Test Rec. Timb. Developm. Ass., Lond.* No. *E/TR*/8, 1958. pp. 8 + 1 gph, 1 dgm. 5 refs.

Gives details of static bending tests made on twenty 8-ft. and twenty 9-ft. pieces of *Larix decidua* of 2 × 4 and 2 × 6-in. cross-section respectively. Tabulated results are given indicating the means and standard deviations of density and ultimate bending stress of the structural sizes and of the associated small clear specimens.

2327. BOOTH, L. G. **A note on the derivation of working stresses in bending for Scottish grown European Larch**. *Test Rec. Timb. Developm. Ass., Lond.* No. *E/TR*/10, 1958. pp. 4 + 2 tbls. 2 refs.

Makes a comparison, based on recent English tests and earlier U.S. results [see previous abstr. and *F.A.* 13 No. 1513], of the ultimate bending strength of Scottish-grown *Larix decidua* and N. American Douglas Fir. As a result, it is recommended that: (i) Scottish-grown *L. decidua* be reclassified as a Group I timber (according to *Brit. Stand.* No. C.P. 112) with a basic stress in bending of 1000 lb./sq. in.; (ii) the scope of tests on the timber be widened to investigate its compression and shear strength.

2328. BOOTH, L. G., and SILVESTER, F. D. **Static bending tests on Keruing [*Dipterocarpus* spp.] and Red Meranti [*Shorea* sp.] in structural sizes.** *Test Rec. Timb. Developm. Ass., Lond.* No. *E/TR*/2, 1957. pp. 17 + 1 dgm., 6 gphs., 2 tbls. 3 refs. Price 3*s*. 6*d*.

Presents results of static bending tests on 50 pieces each of the two timbers (in structural sizes). Typical load-deflection curves are shown, and the results of bending tests on small clear specimens taken from the fractured structural beams, are presented in an addendum.

2329. MAMADA, S., YAMADA, J., and HIRAI, S. **[Shearing moduli of plywood, hardboard and particle board.]** *J. Jap. Wood Res. Soc.* 5 (4), 1959 (127–30). 5 refs. [Jap.e.*e*.] P.R.

Experiments were made to measure moduli of shear, using a standard test procedure. Results, shown in graphs and tables, indicate that though the measuring and calculating method used is satisfactory for hardboard and particle board, certain inherent factors in plywood such as ply-construction, veneer quality and glue used, may cause difficulties.

812.8. Workability. Working Properties

2330. FLAMWELL, C. T. **The machining properties of *Brachystegia microphylla*.** *Tech. Note Util. Div. For. Dep. Tanganyika* No. 15, 1959. pp. 3.

[Cf. *F.A.* 20 Nos. 2311–4.] On the whole *B. microphylla* is a difficult timber to machine. It would be suitable for construction work where small defects and a somewhat rough finish were not a disadvantage, and where nailed joints are not used. *From author's summary*.

2331. FLAMWELL, C. T. **[The machining properties of Tanganyika woods.]** *Tech. Note Util. Div. For. Dep. Tanganyika* Nos. 18–21, 1959. Each pp. 2.

Casearia battiscombei, *Macaranga conglomerata*, *Ficalhoa laurifolia*, and *Cupressus lusitanica*.

2332. BRYCE, J. M. **[The machining properties of Tanganyika woods.]** *Tech. Note Util. Div. For. Dep. Tanganyika* Nos. 16 & 17, 1959. pp. 3; 4.

Albizzia antunesiana, and *Julbernardia* (*Isoberlinia*) *globiflora*.

813. Wood Chemistry

See also Nos. 2465–6, 2481.

2333. PEARL, I. A., BEYER, D. L., and LASKOWSKI, D. **Alkaline hydrolysis of representative Palms**. *Tappi* 42 (9), 1959 (779–82). 6 refs. P.R.

Presents results of preliminary experiments in which single specimens of 26 representative species of the family Palmaceae were subjected to alkaline hydrolysis, and discusses the occurrence of certain compounds (some specific to certain species and possibly of taxonomic significance), their qualitative and quantitative relationships, and their relation to other wood components.

2334. UGARTE LAISECA, J., *et al.* Laboratorio general de química forestal. Química de la madera. **[General laboratory of forest chemistry. Wood chemistry]**. *An. Inst. For. Invest. Exp. Madrid* 30 (3), 1958 (205–7). [Span.]

Presents the results of chemical analyses of wood of *Buxus sempervirens*, *Gleditsia triacanthos*, *Pinus sylvestris*, *Quercus ilex*, *Pinus nigra* and *Pinus pinaster*.

2335. KAWASE, K., UJIIE, M., and TOSAKA, K. **[Chemical properties of some woods and the sulphate pulps.]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (1), 1959 (239–55). 15 refs. [Jap.e.*e*.]

Gives tabulated results of tests on the wood and pulps of *Abies sachalinensis*, *Picea glehnii*, *Larix leptolepis*, *Pinus strobus*, *P. banksiana*, *Betula platyphylla*, *Populus maximowiczii*, *P. nigra* var. *italica*, *Fraxinus mandshurica* var. *japonica* and *Robinia pseudoacacia*. The wood properties measured were: ash %; solubility in ethanol/benzene, cold water, hot water and 1% NaOH; %s of cellulose, holocellulose, pentosan and lignin; calorific value; sp. gr.; and fibre length. Pulp yields, Roe number, ash, α-cellulose, and pentosan %s, freeness, and breaking length, are also given.

2336. Izučenie himičeskogo sostava drevesiny daurskoj listvennicy. **[Study of the chemical composition of the wood of *Larix gmelinii*.]** *Trud. Inst. Les.* No. 45, 1958 (1–135). Many refs. [Russ.]

A collection of papers: *Larix gmelinii* (*L. K. Pozdnjakov*) [distribution, growth, etc.]; The chemical composition of the wood of *L. gmelinii* (*I. P. Cvetaeva et al.*) [cf. *F.A.* 15 No. 2861]; The distribution of arabogalactan in *L. gmelinii* wood (*M. M. Cočieva et al.*); Study of localization of arabogalactan in the cell walls of Larch wood (*A. F. Zajceva* and *N. I. Nikitin*); On the problem of getting sulphate pulp from *L. gmelinii* wood (*A. F. Zajceva*); Sulphate pulp from *L. gmelinii* wood (*A. F. Zajceva et al.*); Some data on finishing sulphate pulp from *L. gmelinii* wood (*A. F. Zajceva*); Complex utilization of *L. gmelinii* wood (*A. F. Zajceva et al.*) [on the extraction of the wood, and the use of the extractives]; The properties of low-substituted carboxymethylcellulose from *L. gmelinii* wood (*G. A. Petropavlovskij* and *N. I. Nikitin*); Sulphate cooking of *L. gmelinii* wood (*M. K. Jur'eva* and *N. I. Nikitin*).

2337. SHARKOV [ŠARKOV], V. I., DMITRIEVA, O. A., and POTAPOVA, N. L. **The chemical composition of Birch wood.** *Naučnye Doklady Vyssej Školy, Lesoinženernoe Delo* No. 4, 1958 (202–6). [Russ.] From *abstr.* in *Chem. Abstr.* 53 (17), 1959 (16535). P.R.

Using standard methods of analysis on *Betula verrucosa* (35–40 years old), *B. pubescens*, and various hybrids, the %'s of cellulose, pentosans, lignin polyuronic acids, and AcOH were determined and compared for bole and branches. Because of its high cellulose and lignin content, Birch is held suitable for pulp manufacture and for hydrolysis.

813.1. Chief Organic Constituents. Constituents of the Cell Wall

See also Nos. 2309, 2321–2, 2367, 2372–3, 2440–1, 2532.

2338. PEPPER, J. M. **Chemical aspects of hardwood lignins.** *Tappi* 42 (9), 1959 (793–800). 53 refs. P.R.

An extensive review of the literature on the chemical structure of the protolignin of hardwoods (mainly Aspen but also Maple, Birch and Oak). The methods and problems associated with its isolation are discussed, and suggestions made for future research.

2339. SALO, M.-L. **Lignin studies. I. Investigations concerning lignin determination. II. The lignin content and properties of lignin in different materials.** *Maataloustieteellinen Aikakauskirja, Helsinki* 29 (4), 1957 (185–93; 202–10). 39 refs. [E.e.fi.] A.P.B.

(I) A method is described of determining the amount of lignin corresponding to that indigestible by animals. (II) Materials studied included Spruce, Pine, Birch and Oak wood, Pine bark, and cork. Tabulated results show crude protein, membrane substances and lignin %s and the OCH_3 content of the lignin.

2340. PEARL, I. A., and BEYER, D. L. **Studies on the chemistry of Aspenwood. IV. Oxidation of Aspen lignosulphates with alkaline cupric and silver oxide.** *Tappi* 42 (9), 1959 (800–4). 17 refs. P.R.

2341. ISTAS, J. R., and RAEKELBOOM, E. L. Le dosage de la cellulose des bois coloniaux. **[Determining the cellulose content of tropical woods.]** *Industrie chimique belge, Bruxelles* 22 (9), 1957 (1035–44). 26 refs. [F.f.du.e.g.] P.O.

Seven methods of wood cellulose determination were applied to *Gossweilerodendron balsamiferum*, *Tessmannia lescrauwatii* and *Terminalia superba*. The % of raw and pure cellulose varied considerably for the same species according to method, but the %s of corrected cellulose [corrected for lignin and pentosans] were closer. If wood cellulose is admitted to be identical with cotton, the Kürschner-Hoffer and the Kracjinovic methods are the most accurate, but if the cellulose contains elements other than glucose, its accurate measurement will be more difficult.

2342. SELDERS, A. A., STASKIEWICZ, B. A., and PICARD, J. P. **Carbon-14 labeled wood cellulose.** *Tappi* 42 (5), 1959 (409–12). 6 refs. P.R.

Briefly reviews the development of radioactive-tracer techniques in wood research since 1954 and describes the two main aims of the present study: (1) to follow the progression pattern of tracer material through the tree in connexion with investigations on wood growth and nutrient uptake; and (2) to obtain enough wood cellulose tagged with C^{14} to be employed in connexion with cellulose structure investigations and solution behaviour studies. Labelled wood cellulose was prepared *in vivo* by injecting young Pines with small doses of aqueous solution of $Na_2C^{14}O_3$ and also by exposing the trees to a controlled atmosphere of $C^{14}O_2$. Trees treated during the growing season were felled to determine the comparative distribution of radioactivity in roots, bole, branches, foliage and bark, and small amounts of C^{14}-tagged cellulose were prepared to study the reactions occurring during the viscose process. Scintillation counts and autoradiographs indicated that labelling occurring during growth involved both diffusion and laydown [deposition] of radioactive material through the flow of sap. The level of radio activity in the holocellulose samples extracted from the growth ring containing the highest radioactive concentration was higher for the injected than for the exposed trees. Evidence also indicates that the C^{14} becomes an integral part of cellulose molecular structure and of all related compounds such as glucose, mannose and xylose.

2343. KOZMÁL, F., and RENDOŠ, F. **Primary cell wall of wood. II.** *Papír a Celulosa* 14, 1959 (97–8). [Cz.?] From *abstr.* in *Chem. Abstr.* 53 (19), 1959 (18478). P.R.

[Cf. *F.A.* 20 No. 5144.] Chromatographic analysis of acid-hydrolysis products of Spruce and Poplar semichemical and chemical pulps, wood parenchyma cells and viscose residual fibres, demonstrated the predominance of mannose over glucose and xylose, and the presence of amino acids in those materials in which the primary cell-wall was the least degraded (viscose residual fibres and the parenchyma cells). The materials in which amino acids were detected chromatographically also had the highest total N contents. The presence of mannans and proteins in the wood primary cell-wall can explain the observed increase in cellulose reactivity following acid prehydrolysis of the fibres.

2344. HAMILTON, J. K., and THOMPSON, N. S. **A comparison of the carbohydrates of hardwoods and softwoods.** *Tappi* 42 (9), 1959 (752–60). 81 refs. P.R.

Compares the hemicellulose of hardwoods (mainly

Alnus rubra, *Arbutus menziesii*, *Liquidambar styraciflua*, *Nyssa aquatica* and *N. sylvatica*), and of softwoods (*Tsuga heterophylla*, *Thuja plicata*, *Pinus elliottii*, *P. palustris*, etc.), and presents detailed tabulated results of research on the behaviour of hemicelluloses during various pulping processes. These results indicate that the residual extraction-resistant sugars which remain associated with the cellulose as shown by hydrolysis, are not part of the cellulose but are due to inaccessible or highly insoluble polymers intimately associated with it.

2345. Meier, H. Fördelning av hemicellulosakomponenterna i en tallvedsfiber. **[The distribution of hemicellulose components in Pine fibres.]** *Svensk PappTidn.* 62 (19), 1959 (687–91). 6 refs. [Sw.sw. g.e.*e.*] P.R.

Pine tracheids in different stages of development were isolated and after hydrolysis the sugar fractions were determined by paper chromatography. The youngest tracheids, built up of the middle lamella (M) and the primary wall (P), consisted mainly of pectic substances (pectic acid, galactan, araban); the next oldest, in which the transition layer (outer layer of the secondary wall, S_1) had also been deposited, contained reduced amounts of pectic substances and more cellulose, glucomannan [*a*] and glucurono-araboxylan [*b*]. In the next oldest tracheids ($M + P + S_1 + S_2$), the content of *a* increased still further and that of *b* decreased, while in the fully developed tracheids ($M + P + S_1 + S_2 + S_3$) *b* increased considerably. Thus *a* was mainly localized in S_2, the central layer of the secondary wall, and *b* in S_3, its inner layer. This distribution was confirmed by analysis of early and late wood. Early wood, with a thinner S_2 layer, always proved to contain less *a* and more *b* than late wood. *From author's summary.*

2346. Timell, T. E., Glaudemans, C. P. J., and Gillham, J. K. **Recent studies on the polysaccharides of White Birch and other hardwoods.** *Tappi* 42 (8), 1959 (623–34). 90 refs. P.R.

Reviews literature, and discusses data from preliminary experiments, on the structure of the main wood hemicelluloses of *Betula papyrifera*, *B. lutea*, *Populus tremuloides*, *Acer rubrum*, *A. saccharum*, *Fagus grandifolia*, and *Ulmus americana* [cf. *F.A.* 20 No. 2337]. The nitration method [described in detail] of isolation was not entirely satisfactory and further experiments towards better procedures for estimating polymolecularity are recommended.

2347. Timell, T. E. **The polysaccharides of Yellow Birch (*Betula lutea*). II. The constitution of the main hemicellulose.** *J. Amer. Chem. Soc.* 81 (18), 1959 (4989–94). 55 refs. O.R.S.

[Cf. *F.A.* 20 No. 2337.] Identifies the uronic acids obtained on partial hydrolysis of the main hemicellulose constituent and discusses its structure and molecular weight.

2348. Shimizu, M., and Yamada, H. **Distribution of pentosan in the radial direction of wood.** *Journal of the Society of Textile and Cellulose Industry, Tokyo* 15, 1959 (540–4). [Jap?] From *abstr.* in *Chem. Abstr.* 53 (18), 1959 (17503). P.R.

Wood fibre, isolated by mild treatments from samples of Japanese Red Pine, Fir, Beech and Birch, was nitrated with HNO_3/acetic anhydride/CCl_4 (1/1/5). The nitrated portion was dissolved by acetone, the amount of pentosan in the residue being determined by the phloroglucinol method. The pentosans in each wood fibre are unequally distributed in their radial directions, and decrease in amount from the surface to the lumen, the surface of a softwood fibre containing 50–60% and that of a hardwood fibre consisting almost entirely of pentosans. Near the lumen, softwood fibre contains ca. 2–4, and hardwood 8–10% of pentosans.

2349. Ujiie, M. **[Studies on the hemicellulose of "Sasa".]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (1), 1959 (279–313). 117 refs. [Jap.jap.e.]

Studies were made on *Sasa* sp. (bamboo grass) which grows abundantly in Hokkaido. The properties of hemicelluloses A, B, and C are tabulated in the English summary.

2350. Brasch, D. J., *et al.* **Structure of some water-soluble polysaccharides from wood.** *Pulp Paper Mag. Can.* 60 (11), 1959 (342–5). 21 refs.

A review of studies, leading up to investigations on the structure of (arabo) galactans and (galacto) glucomannans in conifers.

2351. Brasch, D. J., and Jones, J. K. N. **The structure of an arabogalactan from Monterey Pine (*Pinus radiata*).** *Canad. J. Chem.* 37 (9), 1959 (1538–45). 21 refs. O.R.S.

The arabogalactan contains *l*-arabinose and *d*-galactose in the ratio 1 to 8. It is highly branched and contains end groups of *l*-arabofuranose and *d*-galactopyranose. Removal of the *l*-arabinose residues leaves a highly ramified galactan. *From authors' summary.*

2352. Croon, I., Lindberg, B., and Meier, H. **Structure of a glucomannan from *Pinus silvestris* L.** *Acta chem. scand.* 13 (7), 1959 (1299–1304). 23 refs. [E.e.] O.R.S.

813.2. Minor Organic Constituents. Extractives. Cell Contents

See also Nos. 1411, 1413, 2387, 2470, 2549.

2353. Erdtman, H., and Norin, T. **The identity of thujopsene and widdrene and of hinokiic and widdrenic acids [as heartwood constituents or in essential oils from the leaves of conifers].** *Acta chem. scand.* 13 (6), 1959 (1124–8). 19 refs. [E.e.] [The chemistry of the natural order of Cupressales XXII.] [Cf. *F.A.* 16 No. 4805; 20 No. 1019.] O.R.S.

2354. Assarsson, A., Lindberg, B., and Vorbrüggen, H. **The chemistry of the natural order Cupressales XXIII. *L*-arabinoic acid from the heartwood of *Austrocedrus chilensis* (D. Don), Florin et Boutelje.** *Acta chem. scand.* 13 (7), 1959 (1395–6). 3 refs. [E.e.] [Cf. *F.A.* 17 No. 3263.] O.R.S.

2355. Zavarin, E., Smith, R. M., and Anderson, A. B. **Paper chromatography of the tropolones**

of Cupressaceae. II. *J. organ. Chem.* 24 (9), 1959 (1318–21). 15 refs. O.R.S.

[Cf. *F.A.* 18 No. 931.] Heartwood samples of 6 *Cupressus* spp., *Chamaecyparis lawsoniana*, *Papuacedrus torricellensis* and 6 *Juniperus* spp. were examined, and the results, together with those derived from literature for other species of *Cupressus*, *Chamaecyparis* and *Juniperus*, are tabulated and discussed.

2356. GARDNER, J. A. F., BARTON, G. M., and MACLEAN, H. **The polyoxyphenols of Western Red Cedar (*Thuja plicata* Donn.). I. Isolation and preliminary characterization of plicatic acid [from the mixture of polyoxyphenols present in the aqueous extractive].** *Canad. J. Chem.* 37 (10), 1959 (1703–9). 13 refs. O.R.S.

2357. NAIR, G. V., and RUDLOFF, E. VON. **The chemical composition of the heartwood extractives of Tamarack (*Larix laricina* (du Roi) K. Koch).** *Canad. J. Chem.* 37 (9), 1959 (1608–13). 20 refs. O.R.S.

2358. CLARK-LEWIS, J. W., and MORTIMER, P. I. **Occurrence of 4-hydroxypipecolic acid in *Acacia* species.** *Nature, Lond.* 184 (4694), 1959 (1234–5). 4 refs.

The acid was first extracted from heartwood of *A. excelsa*, then from the wood of other species, and from the fresh leaves of *A. oswaldii*.

2359. AKISANYA, A., BEVAN, C. W. L., and HIRST, J. **West African timbers. Part II. Heartwood constituents of the genus *Pterocarpus*.** *J. Chem. Soc.* Sept./Oct., 1959 (2679–81). 5 refs. O.R.S.

Homopterocarpin, pterocarpin and santal were obtained from *P. osun*, acetyloleanolic acid from *P. osun*, *P. santalinoides* and *P. mildbraedii*, angolensin and an unidentified substance $C_{17}H_{14}O_6$ from *P. erinaceus*, and arachidic acid from *P. santalinoides*. Pterostilbene was not isolated from any of the four species. *P. santalinoides* and *P. mildbraedii*, which are susceptible to fungus and insect attack, yielded no phenolic compounds.

2360. RUDMAN, P. **The causes of natural durability in timber. III. Some conspicuous phenolic components in the heartwood of Eucalypts and their relationship to decay resistance.** *Holzforschung, Berlin* 13 (4), 1959 (112–5). 14 refs. [E.e.g.] P.R.

[Cf. *F.A.* 20 No. 2343.] Sawdusts from the outer heartwood of 13 species of *Eucalyptus* were extracted successively with ether and methanol, and the methanol extracts studied in order to locate any substance likely to contribute to decay resistance. Gallic and ellagic acids were present in all the species examined, and two polyphenols were found in a number of the species. Methods of isolating the polyphenols, and their properties, are reported. Tests on sawdust, using *Coniophora cerebella*, indicated that gallic and ellagic acids were not toxic at the levels at which they occur in *E. microcorys*; while the two polyphenols were slightly toxic, but not sufficiently so to constitute the sole, or even a major, cause of decay resistance. *From author's summary.*

2361. HILLIS, W. E., and CARLE, A. **The influence of extractives on Eucalypt pulping and paper making [with discussion].** *APPITA, Melbourne* 13 (2), 1959 (74–83). 27 refs.

The outer and inner heartwood from a sample of *Eucalyptus gigantea* contained respectively 1·1 and 0·71% free ellagic acid and 0·17 and 0·08% free gallic acid. After hydrolysis the extractives yielded further ellagic acid. Gallic acid and the ellagic acid/gallic acid derivatives are held to be largely responsible for the darkening of stored sawn wood and, together with ellagic acid, for the high viscosity of concentrated spent cooking liquors. *From authors' summary.*

2362. TARDIF, J. W. **Problems in improving the brightness of Eucalypt groundwood.** *APPITA, Melbourne* 13 (2), 1959 (58–73). 16 refs.

Discusses the problems, which are caused mainly by the high content of polyphenolic substances (tannins) in mature Eucalypt wood, and their tendency to react with salts of metals to form coloured compounds.

2363. CAPITO, L., and PANIZZI, L. **Components of the wood of *Eucalyptus camaldulensis*. I.** *Annali di Chimica, Roma* 49, 1959 (771–81). [It.?] From *abstr.* in *Chem. Abstr.* 53 (20), 1959 (19385). P.R.

The heartwood was extracted with acetone, and the extract (6·5–7·5%) separated by successive extractions with petroleum ether, ether, and Et acetate. Six main compounds were separated by fractional crystallization, paper chromatography, and chromatography on cellulose, and other unidentified compounds were detected.

2364. FUMASONI, S. Cromatografia di estratti acquosi di *Eucalyptus rostrata*. **[Chromatography of aqueous extracts of *E. rostrata*.]** *Cellulosa e Carta* 10 (9), 1959 (21–3). 2 refs. [It.f.e.g.]

A chromatographic analysis has revealed the presence of a number of sugars—xylose, mannose, arabinose, galactose, and lyxose.

813.3. Ash Constituents

See No. 2478.

813.5. Reaction with Metals

2365. GRAY, V. R. **The acidity of wood.** *Res. Rep. Timb. Developm. Ass., Lond.* No. *C/RR*/1, 1958. pp. 14 + 2 gphs., 3 tbls. 9 refs.

Measurements of pH made on the sawdust of 146 hardwood and 21 softwood species showed all to be acidic on the average, except *Araucaria angustifolia*, which gave occasional markedly alkaline results. A range of 3 pH units may be found within one species and almost 50% of the species examined can be acidic enough to accelerate the corrosion of metals under damp conditions. The relation between pH and mechanical properties is discussed.

813.6. Effect of Chemicals on Wood. Resistance to Chemical Attack

See also No. 2302.

2366. NÁJERA ANGULO, F., *et al.* Sección de maderas: características y aplicaciones. Investigación y estudio de las clases de madera más convenientes para la construcción de cubas que han de contener ácido sulfúrico con destino a fines industriales. **[Wood section: properties and uses. Study of the classes of wood most suitable for vats built to contain industrial H_2SO_4.]** *An. Inst. For. Invest. Exp. Madrid* 30 (3), 1958 (67–100 + 6 plates). [Span.]

Specimens 2 × 2 × 30 cm. of (1) *Castanea sativa*, (2) *Pinus palustris*, (3) *P. halepensis*, (4) *P. nigra*, (5) *P. pinaster*, (6) *Cedrus atlantica*, (7) *Chlorophora excelsa*, (8) *Erythrophleum guineense*, (9) *Lophira procera* and (10) *Mitragyna macrophylla*, were treated with a 20° Baumé solution of H_2SO_4 at a constant temperature, and were classified according to the degree of penetration as follows: (*a*) very resistant—(8) and (9), (*b*) moderately resistant—(1), (2) and (4), and (*c*) susceptible—the rest. Tests of strength as a function of hours of treatment again showed greatest resistance in (8) and (9); (7) also showed reasonable strength properties, despite the high degree of penetration. Studies of the structure of the wood showed that, in conifers the resin canals, and in hardwoods the vessels, provide the means by which the acid penetrates. Of the woods studied (8) and (9) are highly suitable for acid vats; (4) and (7) have less, but still adequate, resistance; failing the above two classes, (5), if it has not been tapped, may be found adequate.

814. Natural Durability. Old Wood. Fossilized Wood

See also Nos. 2279, 2359–60, 2467–71, 2477–8, 2481.

2367. BRASCH, D. J., and JONES, J. K. N. **Investigation of some ancient woods.** *Tappi* 42 (11), 1959 (913–20). 37 refs. P.R.

Describes investigations in which ancient woods were shown to contain carbohydrate material. A specimen from *Cedrus penhallowii* was fractionated, and the hemicelluloses and α-cellulose isolated were found to be very similar in structure and composition to polysaccharides isolated from woods (mainly *C. libani*) of recent origin.

815. Effect of Growth Factors on Structure and Properties

See also Nos. 1421–3, 2287–8, 2469, 2504, 2510, 2512.

2368. KÜBLER, H. Studien über Wachstumsspannungen des Holzes. II. Die Spannungen im Faserrichtung. III. Längenänderungen bei der Wärmebehandlung frischen Holzes. **[Studies on growth stresses in trees. II. Stresses along the grain. III. Dimensional changes during heat treatment of green wood.]** *Holz Roh- u. Werkstoff* 17 (2; 3), 1959 (44–54; 77–86). 14 + 17 refs. [G.g.e.] P.R.

[Cf. *F.A.* 20 No. 3740.] (II) Assuming that growing cells of stems develop a constant tension stress along the grain and that this is the only cause of longitudinal stresses, a stress distribution for the stem cross-section was deduced which agrees very well with Jacob's measurements [see *F.A.* 8 No. 308]. Tension stresses decreased from the bark inwards, first slowly and then faster; at ca. half-way to the pith they change into compression stresses, which attain very high values near the pith. When logs are cross-cut, opposed longitudinal stresses are released in the inner and outer parts of the stem, inducing transverse stresses which may cause shakes. Methods of preventing shakes are discussed in the light of these findings.

(III) When heated in water, green wood of Beech, Pine and Oak shrank up to ca. 70° C., and then swelled at temperatures between 70 and 100°; in cooling, it shrank to 70° and then swelled. In addition, temperatures near 100° caused plastic dimensional changes roughly proportional to the logarithm of the 'cooking' time. The connexions of these plastic dimensional changes with growth stresses are analysed and explained in detail. With the first boiling, tangential swelling was observed, especially in the wood of the outer parts of the stem, but also in that from near the centre, where the wood had been under tension for a long time in the tree. The plastic tangential swelling caused by boiling is accompanied by a radial shrinkage which is less than the tangential swelling but is greatest where the tangential swelling is great. After long boiling, the wood shrinks slowly in all directions, a feature that seems to have no connexion with growth stresses.

2369. KANO, T. **[On the breadth of annual rings, the percentage of summerwood and the bulk-density of Sugi (*Cryptomeria japonica* D. Don) grown at Kamabuchi District.]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (1), 1959 (139–51). 9 refs. [Jap.e.*e.*]

The factors under consideration were investigated separately for the parts of the stem inside and outside the live crown, for sapwood and heartwood, and for annual rings with and without coloured bands due to the presence of resin cells.

2370. YAZAWA, K., and FUKAZAWA, K. **[Studies on the relation between physical properties and growth condition for planted Sugi (*Cryptomeria japonica* D. Don) in Central District of Japan. V. On the specific gravity, fiber saturation point and volumetric shrinkage of the spring- and summerwood.]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (1), 1959 (93–117). 24 refs. [Jap.jap.e.*e.*]

[Cf. *F.A.* 19 No. 4814.] Early (e.w.) and late wood (l.w.) were separated from disks of wood taken at breast height from 3 trees growing on different sites, and attempts were made to determine variations in *R* (oven-dry-weight/green volume in kg./cu. m.), a_v (volumetric shrinkage % =

$$\frac{\text{green vol.} - \text{oven-dry vol.}}{\text{green vol.}} \times 100\text{), and f.s.p. (fibre}$$

saturation point %). Mean value of *R* for e.w. in sapwood was 0·8–0·9 of that in heartwood, while for l.w. it was 1·1. It thus appears that the greater density of heartwood in the wood as a whole is due to the heavier e.w. in heartwood. The ratio of R of e.w. to l.w. was 2·8 in all trees (3·1 in sapwood, 2·6 in heartwood). Mean f.s.p. was 26·3% in e.w. and 24·8% in l.w. Mean a_v of sapwood as a whole was 1·2–1·3 times that of heartwood, and mean a_v of e.w. was 1·5–1·6 times that of l.w. Mean a_v/R of e.w. was 46.4 and of l.w. 25·8.

2371. MIYAJIMA, H. **[The physical and mechanical properties of plantation-grown White Pine [*Pinus strobus*], Jack Pine [*P. banksiana*] and Japanese Larch [*Larix leptolepis*] in the Tomakomai Experiment Forest of Hokkaido University.]** *Res. Bull. Exp. For. Hokkaido Univ.* 19 (3), 1958 (99–216 + 3 plates). 27 refs. [Jap.jap.e.*e.*]

Tests were made on 8 trees of 40-year-old White Pine (*a*), 4 of 37-year Jack Pine (*b*), and 5 of 52-year Japanese Larch (*c*). The sp. gr. and various strength properties of (*a*) were inferior to those of (*b*) and (*c*) and also to those recorded for White Pine from virgin stands in Canada. Sp. gr. and strength properties of (*b*) were inferior to those of virgin Jack Pine in Canada. In (*c*) the width of annual ring decreased with increasing age, particularly after 40 years, when it was usually < 1 mm. Mean values of sp. gr. and strength properties of (*c*) were high in comparison with (*a*) and (*b*), but the values were distributed over a very wide range, owing to the change in width of annual ring noted above: the narrow-ringed was much denser and stronger than the wide-ringed. In general, (*c*) was inferior in sp. gr. and strength to Japanese Larch grown in plantations in W. Germany and England.

2372. ZOBEL, B., WEBB, C., and HENSON, F. **Core or juvenile wood of Loblolly and Slash Pine trees.** *Repr.* from *Tappi* 42 (5), 1959 (345–56). 48 refs.

[Cf. *F.A.* 20 No. 990.] Reports investigations made in 1957–58 into the characteristics of core-wood (c.w.) within a tree and among trees (including determination of the relationship of wood characteristics at b.h. to those of the entire bole), based on an intensive study of 47 *Pinus elliottii* and 13 *P. taeda* (9 aged 17, and 4 aged 50 years), and on an extensive study of 670 *P. taeda* of various ages. All the trees were grown in the Carolinas and adjoining States. Results indicate that the sp. gr. of c.w. within an individual tree is, for all practical purposes, uniform, whereas that of mature wood (m.w.) drops rapidly with height up the bole, the sp. gr. of c.w. being considerably lower than that of m.w. at any position up the tree. In young trees the correlation coefficients (r) between the sp. gr. of c.w. at b.h. and that of the entire c.w. zone were very close ($r = 0{\cdot}88$ for *P. elliottii*, and 0·77 for *P. taeda*). Similar close relationships were found between the sp. gr. of c.w. and that of the total tree bole. Both species showed similar cellulose yield patterns, the water-resistant carbohydrates of the c.w. increasing with tree height, and the α-cellulose remaining nearly constant from base to top of the tree.

2373. WILDE, S. A., and PAUL, B. H. **Growth, specific gravity, and chemical composition of Quaking Aspen on different soil types.** *Rep. U.S. For. Prod. Lab., Madison* No. 2144, 1959. pp. 4 + 4 tbls., 1 photo. 6 refs.

Reports results of a preliminary investigation of the sp. gr. and chemical composition of *Populus tremuloides* grown on different soils [cf. *F.A.* 8 No. 2488] in order to ensure that it will produce pulpwood of satisfactory quality on all soils capable of supporting it, whether grown by natural or artificial silvicultural methods. The best rate of growth was observed on well drained sandy loams, lower yields being obtained from other soils studied, including loams, and the lowest yield from well drained coarse sands. Wood of the highest mean sp. gr. (ca. 0·40) is produced on well drained, fine-textured soils, and that of the lowest mean sp. gr. (0·35) on poorly drained soils, but variations in both sp. gr. and chemical composition were $\ngtr 10\%$. These relatively small differences indicate that pulpwood of acceptable quality is obtainable even on soils of low fertility, the pulp yields comparing favourably on a cord basis with those obtainable from good sites.

82. Conversion, Shaping, Assembly and Finishing of Wood: General

821. Barking

See Nos. 1864–5, 2431.

822. Saws and Sawing

See also Nos. 2408–9.

2374. PAVLIK, R. Le développement de la construction des machines à bois en Tchécoslovaquie. **[The development of woodworking machines in Czechoslovakia.]** *Rev. int. Bois* 26 (257), 1959 (173 . . . 179). [F.]

Gives some account of the Bruna and other frame saws, veneer cutters, and machines for the manufacture of fibre- and chipboards.

2375. HASDAN, S. M. O nagreve ramnyh pil pri pilenii. **[The heating-up of frame saws in work.]** *Derev. Prom.* 8 (3), 1959 (10–2). [Russ.] P.R.

Using a specially constructed electrical thermometer (design given), measurements were made of the heat of frame-saw blades when sawing baulks 120–240 mm. thick, and logs 18–42 cm. in diameter. Readings were taken after the passage of 30 linear m. of timber through the saw, and then after every 30 min. of work. The temperatures at different parts of the blade are tabulated for the different conditions (log size, board thickness, etc.), and the effect of this heating of the blades on their tensioning is discussed.

2376. FLEMMING, H., and RENTSCH, H. Das Bedüsen von Kreissägeblättern beim Schneiden von Holz und Faserhartplatten. **[Sraying circular saw blades in sawing wood and fibreboards.]** *Holzindustrie, Berlin* 12 (2), 1959 (51–3). 4 refs. [G.] P.O.

Pine 20·6 mm. thick and hardboards of rape straw 16 mm. thick were cut by circular saw, with and without a spray fixed to spray the tooth face with an oil emulsion. Spraying when cutting the Pine reduced blunting, clogging by resin, and power consumption, without increasing the wood moisture content.

2377. McMILLIN, C. W., and LUBKIN, J. L. **Circular sawing experiments on a radial arm saw.** *For. Prod. J.* 9 (10; 12), 1959 (361–7; 9*A*). 6 refs.
Describes investigations into the relations of net cutting power to feed rate, cutting angle (from crosscutting via mitring to ripsawing) and depth of cut for flat-sawn *Acer saccharum*, developing a formula and comparing the power requirements for sawing *A. saccharum*, *Pseudotsuga taxifolia* and *Pinus lambertiana*. The blade used was of high quality, flat-ground, 16 in. in diam., having 72 teeth in threes and all the sawing, except ripsawing, was done by down cutting, with the feed of the saw. Ripsawing Hard Maple by this method required ca. 25% more power than up cutting (against the feed).

2378. JONES, D. S. **Thinner circular saws. Studies conducted to determine the practicability of using thinner saws.** *Aust. Timb. J.* 25 (6), 1959 (15 . . . 30).
Studies made by the Division of Forest Products, C.S.I.R.O., demonstrated that saws thinner than those generally used can successfully cut the milder Eucalypts. The use of the thinner saws combined with slower speed, reduced power demand.

2379. FONKIN, V. F. Kruglye pily s plastinkami iz tverdyh splavov. **[Hard-alloy-tipped circular saws.]** *Derev. Prom.* 8 (9), 1959 (15–8). [Russ.] P.R.
Describes in detail the stages in hard-alloy tipping with small tips (0·8–1·5 mm. thick and 4–8 mm. long). Tungsten-carbide tips with cobalt contents of 8, 15, 20, 25 and 30% were used, and the results of ripsawing and cross-cutting the wood of several different species, particle boards, and plywood, at various feed speeds are reported. No definite conclusions are reached.

2380. PAHLITZSCH, G., and DZIOBEK, K. Untersuchungen an einer horizontalen Blockbandsäge. **[Investigations on a horizontal log band-saw.]** *Holz Roh- u. Werkstoff* 17 (9), 1959 (364–76). 6 refs. [G.g.e.] P.R.
After discussing the cutting process and the conditions of band stress, describes investigations made on a horizontal band-saw capable of taking logs ≯ 1 m. in diam., and having five speeds viz. 19·5, 25·4, 29·5, 34·0 and 42 m./sec. The logs used were Pine, Spruce and Kamballa [*Chlorophora* sp.]. Graphs are drawn of the influence on the cutting process of saw speed, feed speed, tooth pitch, and depth of cut. Output and cutting power (c.p.) increased with the feed speed at different tooth pitches and cutting speeds. At a constant feed speed, the c.p. per tooth increased with pitch. At a constant feed per tooth, the c.p. per tooth was lowest at cutting speeds of 25–30 m./sec., while the specific c.p. was lowest at feeds per tooth of ca. 0·2 mm., almost independent of cutting speed. The specific c.p. was very close for all three species in the range investigated. C.p. increased rather more than proportionally with the depth of cut. Near the theoretical maximum feed speed and at higher c.p.'s, the sawn surface became increasingly wavy. *From authors' summary.*

2381. ANTOINE, R. **Would the static saw provide a solution to the inconsistencies in the sawing of lumber?** *Transl. For. Prod. Lab. Can.* No. 131, 1959. pp. 8. *Transl.* from *Rev. Bois Appl.* 14 (4), 1959 (47–51). [Cf. *F.A.* 20 No. 5184.] Limited distribution.

2382. **Two-blade straight-line rip saw.** *Woodwkg. Ind.* 16 (7), 1959 (371). P.R.
Basically a two-saw edger adjustable to predetermined board widths, the two-blade, straight-line ripsaw described is equipped with an additional saw-blade, mounted on an externally splined arbor which works through an internally splined sleeve, so that it can be traversed towards, or from, the fixed-position saw-blade at the operator's right, and set in specific predetermined ripping-width positions semi-automatically. Minimum and maximum widths between saw-blades are 2½ and 12 in. respectively.

823. Planing. Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning

See No. 2407.

824. Forms of Joint. Jointing and Assembly

824.1. Nailed Joints

See also Nos. 2423, 2428.

2383. CRANDALL, L. W. **Allowable loads for 8d nails.** *For. Prod. J.* 9 (8), 1959 (258–62). 4 refs.
Presents results of ca. 50 tests for lateral resistance of 8d nails driven through steel side plates into the side grain (i.e. ⊥ to grain) of stress-grade, 2 × 4-in. Douglas Fir (2 grades), Southern Pine and Hemlock. Single ordinary 8d by 1½ in. nails were used for half of the tests, 8d by 2¼ in. self-clinching nails (i.e. having a notch near the point, ensuring that they are bent back sharply when driven against a hardened steel backing) for one-third, and multiple nailing in the rest. The nail load at 0·015 in. slip and at failure was greater with the clinched nails than for double nailed (from both sides) ordinary nails. Allowable values and safety factors for clinched nails, computed by various methods, are tabulated.

824.4. Dowelled Joints

2384. NEARN, W. T., and CLARKE, J. T. **Dowel joint strength. Effect of dowel type, hole size, and adhesive.** *For. Prod. J.* 8 (11), 1958 (326–9). 3 refs.
A follow-up study [cf. *F.A.* 15 No. 2881] confirming that compressed dowels produce stronger joints than spiral dowels, and spiral dowels stronger joints than regular ones. Of 4 glues tried, a polyvinyl resin was best, followed by a hot animal-hide glue.

824.7. Glued Joints

2385. SAHAROV, M. D. Štampovanie i podpressovka drevesiny v šipovyh soedinenijah. **[The**

moulding and compression of wood in various joints.] *Derev. Prom.* 8 (3), 1959 (7–9). 5 refs. [Russ.] P.R.

Discusses the techniques and advantages of moulding (compressing) the points on small scarf or finger joints; methods of joining veneers or plywoods by cutting the ends to be joined into a wavy or zig-zag outline for gluing; and the compression of tenons and dowels.

2386. Sawada, M., Yagishita, M., and Mori, M. **[Efficiency of plain scarf joints in Akamatsu [*Pinus densiflora*].]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 116, 1959 (85–96). 4 refs. [Jap.jap.*e.e.*]

824.8. Glues and Gluing

See also Nos. 2384–6, 2413, 2415–9, 2457.

2387. Thomas, R. J. **Gluing characteristics of Determa [*Ocotea rubra*].** *For. Prod. J.* 9 (8), 1959 (266–71). 2 refs.

Satisfactory bonds were obtained with resorcinol-formaldehyde, urea-formaldehyde and casein glues. Phenol-formaldehyde bonds were poor, but were greatly improved when the waxy substance characteristic of the wood [cf. *F.A.* 14 No. 2635] was extracted with an ether/C_6H_6 mixture. The rate of water absorption of extracted wood was much greater than that of natural wood, but still considerably below that of *Liriodendron tulipifera* and *Nyssa sylvatica* tested in comparison.

2388. Niwa, T. **[Extension of resin glues by the addition of milled wood from which pentosan has been extracted.]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (1), 1959 (175–81). [Jap.*e.e.*]

Milled wood passing through a 40-mesh sieve was found to be a satisfactory extender for urea or phenol resins. Further tests are to be made with finer milled wood.

2389. Booth, C. C., Hancock, C. P., and Hine, J. M. **Elastomeric adhesives, their uses in forest products.** *For. Prod. J.* 9 (10), 1959 (337–9).

Discusses the merits of elastomeric adhesives, particularly of the following types: casein-latex, contact cement-solvent types, emulsified contact cement, and rubber-asphalt, in various applications, such as bonding metal or metal foil, plastic and fabric overlays to solid wood, plywood or composite boards; panelling to rigid substrates; or edge-bonding lumber and veneer.

2390. Bergin, E. G. **Effect of wood moisture content on gluing.** *Tech. Note For. Prod. Lab. Can.* No. 12, 1959. pp. 13 + tbl.

Discusses the question in general and gives tables showing (*a*) m.c. of wood at various relative humidities (r.h.) and temperatures, and (*b*) effect on r.h. of heating air to various temperatures.

2391. Knight, R. A. G., and Doman, L. S. **Gluing Oak with resorcinol resins.** *Wood* 24 (9), 1959 (365–9).

The effects of 40 variables (brand of glue, initial wood moisture content; prolonged storage of the laminate at room temperature; post-treatment of the laminate by heat (air or steam at 60° C.); effect of low temperature; and variables in the manufacturing process) in the gluing of English Oak were investigated with resorcinol and resorcinol/phenol resin glues. Laminated blocks were evaluated immediately after manufacture and after one year's exposure to weathering by means of a wetting and drying cycle, according to the amount of splitting in the glue lines at the ends of the blocks. Outstanding results were (i) the wide differences in performance between the brands of glue, (ii) the general lack of beneficial effects of post-treatment by heat, and (iii) the marked improvement in bond quality during the year's exposure to weather. Work to explain (ii) and (iii) is in progress.

2392. Petri, V. N., and Permikin, I. P. Vlijanie petrolatuma na pročnost′ kleevogo šva pri skleivanii drevesiny. **[The influence of petrolatum on the strength of the glue line in gluing wood.]** *Derev. Prom.* 8 (7), 1959 (13–4). [Russ.] P.R.

Investigates glue-line strength in gluing wood (*a*) dried in petrolatum, and (*b*) dried and also impregnated with petrolatum, and compares it with (*c*) controls dried under room or kiln conditions. Birch and Spruce test pieces of ca. 65 × 50 × 25 mm. were used. The shear strength of the glue-line was greatest in (*c*), then (*a*), and then (*b*), irrespective of species. Gluing pressures of $\nless$ 5 kg./sq. cm. should be used on impregnated planed wood. Hot-pressing should be avoided in gluing wood impregnated with petrolatum, paraffin wax, or other oily fluids, as it reduces glue-line strength.

825. Cleaving. Adzing. Mechanical Comminution

See Nos. 1870–2, 2431, 2433, 2535.

826. Peeling. Slicing. Trimming, Edging etc. of Thin Sheets

See also No. 2374.

2393. Feihl, A. O. **Improved profiles for veneer knives.** *Repr.* from *Canadian Woodworker, Toronto* Aug., 1959. pp. 3. 2 refs. (Also in *Wood* 25 (1), 1960 (16–8).)

Studies the role of the extreme knife edge and the bevel in rotary veneer cutting, with particular reference to the optimum shape of the 'microbevel' (the 0·01- to 0·02-in.-wide bevel usually ground at 25–30° on the extreme tip of a standard knife) [cf. *F.A.* 18 No. 4636], its effectiveness with various knotty species, and its influence on the shape of the main bevel. In tests made by cutting $\frac{1}{10}$-in. knotty White Spruce veneer, damage to the knife edge caused by knots was very slight for the 8 profiles tested, the smoothest veneer being obtained with a 30° microbevel of 0·01 in. width. This profile was selected as an optimum and its effect on the quality of Yellow Birch veneer was compared with that of a standard knife without microbevel. Both knives remained very sharp until the end of an 8-hr. run on fairly clean bolts, when sand particles caused indentations on the standard knife twice as deep as those on the microbevelled knife. The increased resistance to damage afforded by the microbevel enabled the angle of the main bevel to be decreased, giving a smoother and tighter veneer, and cutting trials on Yellow Birch, White Spruce and Basswood bolts with two angles of main bevel (15 and 10°) gave promising results. A possible extension of the technique of the microbevel to other woodworking knives, and even to saw teeth, is envisaged.

2394. Nakamura, G., and Saito, M. **[Studies on rotary lathe cutting. Report II. Effect of nosebar opening on the quality of Lauan [*Shorea* spp.] veneer and measurements applying to quality of commercial Lauan veneer cut at several plywood factories.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 108, 1958 (225–36). 8 refs. [Jap.e.*e*.]

827. Bending. Moulding (other than by Cutting)

See Nos. 2418–9.

829.1. Finishing

2395. Kušnirskaja, M. C., and Prodanenko, V. M. Smesevye krasiteli dlja drevesiny. **[Mixed dyes for wood.]** *Derev. Prom.* 8 (11), 1959 (4–6). [Russ.russ.] P.R.

The light reflection spectra of dyed Beech are compared with those of natural Walnut and *Swietenia mahagoni*, and data are given on the absorption spectra and other properties of some dyes tested by UkrNIIMOD. Dye concentrations of 1–2% for Beech, 0·5–1% for Oak and 2-3% for Birch are recommended, for giving good imitations of valuable imported species.

2396. Weaver, J. W., Jeroski, E. B., and Goldstein, I. S. **Dyes for preserving wood.** *For. Prod. J.* 9 (10), 1959 (372–4). 18 refs.

Southern Pine ¾-in. cubes were pressure-treated with 2% solutions of 41 commercial dyes, and, after leaching and drying, and (in many cases) artificial weathering, were exposed to six test fungi in soil-block tests. Of these dyes, 8 belonging to the triphenylmethane group were effective in varying degree against the six fungi, with results that sometimes contradicted those of agar plate tests. With the 4 most promising dyes further 3-month tests were made with *Lenzites trabea*, at varying concentrations and retentions. Only ethyl violet (weight loss only ca. 3% for retentions > 1·5%), can be considered an effective fungistatic compound among those so far tested.

2397. Miheev, I. I. Issledovanie processa šlifovanija detalej kruglogo sečenija. **[Investigation of the process of sanding parts circular in cross-section.]** *Derev. Prom.* 8 (10), 1959 (14–6). 6 refs. [Russ.] P.R.

Presents and discusses the results of investigations on a standard Soviet sander, and on modified versions. It is concluded that the reduced output and surface quality resulting from sanding rounded parts are due to the small arcs of contact and the high specific pressures. To improve matters, higher sanding speeds are advocated.

2398. Žukov, E. V. Šlifovanie drevesiny i kačestvo šlifoval′nyh škurok. **[Sanding wood, and the quality of abrasive papers.]** *Derev. Prom.* 8 (5), 1959 (10–2). [Russ.] P.R.

Plots the changes in specific sanding output against time, in belt-sanding of Beech (speed 19·15 m./sec., pressure 0·025 kg./sq. cm.) with glass, flint and electro-corundum (Al_2O_3) abrasives. The relative advantages of these abrasives, and methods of improving the corundum belts are discussed.

2399. Watanabe, H. **The scraper, especially the knife.** *Transl. Commonw. Sci. Industr. Res. Organ. Aust.* No. 4230, 1959. pp. 12 + 10 sets of dgms., 1 photo. 8 refs. Transl. by K. Wells from *Wood Ind., Tokyo* 13 (8), 1958 (15–20). Limited distribution.

Discusses a new German mechanical scraper, methods of sharpening and setting the knife, and the merits of the scraper vs. the sander for finishing plywood surfaces.

2400. Oliver, A. C. **Project 26.1—Weathering. Pilot test (interim report). A study of the behaviour of timbers exposed to atmospheric conditions.** *Test Rec. Timb. Developm. Ass., Lond.* No. *C/TR/*1, 1957. pp. 8 + 1 photo, 5 tbls. Price 3*s*. 6*d*.

Investigates weather effects on *Thuja plicata* and *Entandrophragma cylindricum*, treated with four proprietary finishes. Two finishes failed rapidly, and none was intact after 7 months. The samples will be exposed for a further period for the study of any further effects. A discussion of the experimental procedure is included.

2401. Oliver, A. C. **Project 26.1—Weathering. Main test. Weathering of clear finishes on various timber species.** *Test Rec. Timb. Developm. Ass., Lond.* No. *C/TR/*2, 1957. pp. 8 + 4 photos, 6 tbls., 3 sets of gphs. Price 3*s*. 6*d*.

Describes the weathering effects for 4 and 7 months on *Shorea* spp., *Terminalia ivorensis*, *Entandrophragma cylindricum*, *Quercus* spp., and *Thuja plicata*, treated with 4 proprietary finishes and linseed oil. Of the 5 finishes tested only one (tung oil modified phenolformaldehyde-resin-based varnish) possessed a high degree of resistance after 7 months. *T. plicata* had the best, and European Oak the worst, varnish-holding characteristics of the 8 species tested.

2402. Gray, V. R. **The durability of exterior clear finishes for timber.** *Res. Rep. Timb. Developm. Ass., Lond.* No. *C/RR/*4, 1959. pp. 32 + 9 photos, 9 gphs. 5 refs. Price 3*s*. 6*d*.

Reviews the problems involved in providing a durable exterior clear coating and discusses the merits of 56 proprietary finishes available. As a result of tests on Oak and Western Red Cedar, the respective merits of the finishes were determined.

83. Timber Manufacturing Industries and Products. Uses of Wood as Such

2403. Brehmer, H. Die Heisswasserheizung in holzverarbeitenden Betrieben. **[Hot-water heating in woodworking factories.]** *Holz Roh- u. Werkstoff* 17 (9), 1959 (357–63). [G.g.e.] P.R.

Describes the system in general, and in particular for veneer drying, plywood presses, kilns, steaming pits, and chip- and fibreboard manufacture, space heating, etc.

2404. Ross, P. **The utilization of Teak in Trinidad.** *Carib. For.* 19 (3/4), 1958 [1959] (80–5) 11 refs.

Describes the Forest Department's installations for utilizing thinnings from Teak plantations, which include a fencing factory, a sawmill, and a creosoting plant.

831. Fuelwood and Various Types of Rough Timber

See also Nos. 1871–2, 2404, 2449.

2405. Godley, D. H. **Home grown timber for fencing. Types of fences and design considerations.** *Wood* 24 (9), 1959 (370–2).

Reviews the reasons for fencing, viz. the confinement of animals, the exclusion of man (3 degrees of discouragement), and the provision of privacy and shelter. The design requirements for the different types of fences are discussed, and a full range of designs to suit all purposes is proposed.

2406. Terroin, A. **Trends in the utilization of wood for railway sleepers [in Europe.]** [*Docum.*] *16th Sess. Timb. Comm. Econ. Comm. Europe, Geneva 1958* No. *TIM*/150, 1958. pp. 38. Restricted.

Based on answers to a questionnaire addressed to member countries of ECE.

832.1. Sawmills and Planing Mills

See also Nos. 2374–82, 2404, 2504.

2407. Hyler, J. E. **Modern sawmilling. Parts 126–128.** *Sth. Lumberm.* 199 (2484–2486), 1959 (43 . . . 51; 37 . . . 43; 35 . . . 42).

Planers and matchers, including pretreatment of cupped boards, and brand marking. This concludes the series, begun in 1954 [cf. *F.A.* 16 No. 1171].

2408. Zerhusen, F. Einrichtung und Arbeitsweise eines Blockbandsägewerkes. **[The equipment and working of a log band-saw mill.]** *Holz Roh- u. Werkstoff* 17 (10), 1959 (402–8). 11 refs. [G.g.e.] P.R.

Discusses mill lay-out, the individual processes in log band-sawing, and the relative advantages of band-saws as opposed to frame and circular saws.

2409. Carlberg, R. Kehäsahojen tehosta ja särmäyksen järjestelystä. **[Frame-saw capacity and the organization of edging.]** *Pap. ja Puu* 41 (11), 1959 (561–4). [Fi.sw.e.] P.R.

Three methods of arranging frame saws and edgers are illustrated diagramatically.

2410. Landt, E. F., and Woodfin, R. O. **Amount and grades of lumber from Black Hills Ponderosa Pine logs.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 42, 1959. pp. 24.

An analysis based on 1840 logs, 8–16 ft. long and 5–25 in. in diam., at 4 types of mill. Overrun averaged 29%, sound logs producing less than defective logs. Only 7% was in select grade or moulding. Only two value groups could be distinguished—logs graded 1 and 2 on the one hand, and 3–6 on the other.

2411. Brabin, T. R. **The economics of mill location and some details of a movable sawmill.** *Aust. Timb. J.* 25 (7), 1959 (40 . . . 54).

An analysis based on Tasmanian conditions, where the most variable component of cost in sawmilling is log transport. The problem of frequent and expensive mill transfers has, to a very large extent, been solved by the design and construction of a 'movable' sawmill (lay-out etc. described).

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 2329, 2387 *et seq.*. 2393–4, 2399, 2443, 2459, 2516.

2412. Northcott, P. L., and Colbeck, H. G. M. **Effect of dryer temperatures on bending strength of Douglas-Fir veneers [with discussion].** *For. Prod. J.* 9 (9), 1959 (292–7). 31 refs.

High temperatures and drying beyond the oven-dry condition both reduced the static bending strength of heartwood veneers. Though at 375° F., the combined effect was negligible, at 450° it was often serious. Differences between trees, and also lathe checks, caused great variation in values. One conclusion, reached by extrapolating strength changes in veneers of different thickness (0·025–0·14 in.), that surface fibres were more degraded than centre ones, was doubted in discussion (on grounds of lack of data for lower temperatures). [Cf. *F.A.* 18 No. 3407.]

2413. Ripley, R. H. **A new performance test for interior [Douglas Fir] plywood and its application to panels containing white-pocket veneer.** *For. Prod. J.* 9 (10), 1959 (344–9).

Describes a modified cycle of soaking and drying, using a temperature of 100° F. instead of room temperature for the drying phase, which proved more effective for detecting faults, whether due to white pocket or poor gluing. Resins and hot-press protein were satisfactory with heavily infected veneers, but not cold-press soybean or blood adhesives. [Cf, *F.A.* 17 No. 2036; 20 No. 3761.]

2414. Putkisto, K. Tutkimuksia kaupallisten koivuvanerilaatujen taivutuslujuudesta ja jäykkyydestä. **[Investigations on the static bending strength and rigidity of commercial Birch plywood grades.]** *Pap. ja Puu* 41 (9–11), 1959 (401–12; 475 . . . 488; 553 . . . 558). 33 refs. [Fi.*e.e.*] P.R.

Results of tests on dry and wet specimens, with the grain of the face veneers || or ⊥ to the longitudinal direction of the piece, are given in graphs and tables showing panel thickness, sp. gr., moisture content, swelling, bending strength and rigidity.

2415. Aleksandrov, E. A. O nekotoryh režimnyh faktorah oblicovki plit iz drevesnyh častic. **[Some schedule factors in facing particle boards.]** *Derev. Prom.* 8 (3), 1959 (6–7). [Russ.] P.R.

In veneering particle boards, the most glue per unit of surface area is required on boards made of chips from planer/spindler-moulder machines, and least on boards made from specially cut, flat, thin particles; boards made of chips produced by hammer-mill were intermediate. Pressure in veneering varies between 3 and 10 kg./sq. cm., depending on veneer thickness and glue viscosity, but should not exceed the pressure used in manufacturing the particle boards.

2416. CHUGG, W. A. **The structural glued laminated timber industry in North America.** *Inform. Bull. Timb. Developm. Ass., Lond.* No. *E/IB*/4, 1958. pp. 78. 47 refs. Price: 10*s.*

Part I describes the timber and glues used, and discusses methods, inspection and organization. Part II gives extensive details of the manufacturing processes of 7 specific firms. There are numerous illustrations of cutting, scarfing, sawing, and other machines used.

2417. KOLB, H. Holzleimbau und Materialprüfung. **[Glued timber construction and materials testing.]** *Holz-Zbl.* 85 (134), 1959 (1799–81). 4 refs. [G.]

Describes testing methods for finger joints, laminated beams and building members variously constructed [cf. *F.A.* 20 No. 2430].

2418. FINNORN, W. J., and RAPAVI, A. **Effect of lamination thickness on strength of curved laminated beams.** *For. Prod. J.* 9 (8), 1959 (248–51). 5 refs.

Within the range tested (¼-¾ in.), thickness of laminations in 6 × 6-in. White Oak beams curved to an inner radius of 72 in. did not significantly affect static bending strength, tested with loads applied radially to the convex face. Modulus of rupture and maximum load were significantly greater than for straight controls [cf. *F.A.* 18 No. 2178].

2419. **[Research in laminated wood. Report II. On the fabrication and properties in respect to its strength and adhesion of curved laminated wood.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 109, 1958 (1–76 + 10 plates). 12 refs. [Jap.e.*e.*]

[Cf. *F.A.* 20 No. 1110.] Gives details of the selection and preparation of the wood for the laminae (*Pinus densiflora*), and the calculation of the minimum safe bending radius of each scarf-jointed lamina. Preliminary tests showed casein and resorcinol-formaldehyde glues to be the best, and sample curved laminates were made accordingly. Spring-back after the removal from the moulds was small, and shear and delamination tests showed high strength qualities. Bending and end-thrust tests were made on the curved laminates, and stress distribution curves are presented for the various conditions. Finally, 3-hinged arches were constructed from the curved members, and tested structurally to destruction for horizontal and vertical deflection under load. Results of all the tests are given in tables and graphs.

833. Timber in Buildings and Engineering Structures (Manufacture and Use)

833.1. Building Components and Fittings: General

See also Nos. 2416–7, 2459.

2420. **New South Wales timbers for building scantling.** *Leafl. For. Comm. N.S.W.* No. 3, 1959. pp. 4.

Includes, among native hardwoods used, *Eucalyptus pilularis, E. saligna, E. maculata, E. microcorys, E. obliqua, E. resinifera, E. eugenioides* and *E. grandis*, and the locally grown Monterey and Cypress Pine. A number of grading rules to assist in the selection and marketing of timber for scantlings is given.

2421. VENKAIYA, N. **Small-dimensioned short-lengths of timber and their suitability for structural purposes.** *Indian For.* 85 (10), 1959 (592–9). 3 refs.

Discusses the suitability of such timber for modern methods of construction (particularly the use of timber connectors) and stresses the need for standardizing the structural sizes of small-dimensioned stock.

2422. MASANI, N. J., and SETH, S. K. **Utilization of small-dimension stock in the building industry through modern timber engineering.** *Indian For.* 85 (10), 1959 (600–2).

Gives tabulated data on modulus of elasticity, working stresses, refractoriness for seasoning, and chemical treatability of 13 fast growing Indian species.

2423. STERN, E. G. **Nailed trussed rafters with hardboard gusset plates.** Wood Research Laboratory, Virginia Polytechnic Institute, Blacksburg. 1959. pp. 15. P.R.

Presents details of rafter design, incorporating hardboard gussets (data on tensile strength given), and examines various causes of failure resulting from compression, bending, and tension. Nail-holding properties are also examined.

2424. KETCHUM, V. **Timber domes—design and construction.** *Wood* 24 (10; 11), 1959 (400–4; 440–3).

Discusses the design of radial, geodesic, and triangular-pattern domes (with actual examples), and gives details of construction, costs, etc.

833.2. Special Uses in Residential, Commercial and Public Buildings

2425. AARON, J. R. **Use of home-grown softwood in house construction.** *For. Rec. For. Comm., Lond.* No. 42, 1959. pp. 12. Price 1*s.* 6*d.*

Report on an inquiry carried out mainly by consulting local authorities concerned with municipal housing in Great Britain. A list is given of sawn timbers in common use by the Scottish Special Housing Association (dimensions for different uses —flooring, roofing, internal work etc.).

2426. HIRAI, S., *et al.* **[Research on lumber for home construction.]** *Misc. Inform. Tokyo Univ. For.* No. 12, 1957 (245–98). [Jap.jap.]

A detailed examination in 1954–55 of 92 recently built, all-wood, 1- and 2-storey houses in various parts of Japan, detailing in tables the chief species used (chiefly Sugi, then Hinoki) by cross-section, numbers and volume, what they are used for, the volume of timber per unit of plinth area (averaging 3·0 koku) and the main lengths required.

833.5. Wood in Bridges, Culverts etc.

2427. **Increasing the life of Brush Box decking.** *Leafl. For. Comm. N.S.W.* No. 4, 1959. pp. 4.

Examines briefly the causes and extent of fungal decay in *Tristania conferta* decking planks, and describes a method of placing thin strips (shims) of creosote-impregnated softwood between the planks and bearers to counteract possible decay at these points of contact (i.e. where fungus-attracting moisture is retained).

834. Shingles. Cooperage. Packing Containers. (Manufacture and Use)

See also Nos. 1830, 2366.

2428. Anderson, L. O. **Nailing better wood boxes and crates.** *Agric. Handb. U.S. Dep. Agric.* No. 160, 1959. pp. 40.

Covers types and sizes of nails, methods of nailing different types of boxes and crates, nail resistance, and nailing properties of different timbers.

835. Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Applications etc.

See also Nos. 2458, 2462.

2429. Bobrowicz, E. Ustalenie baz surowcowych świerkowego i jodłowego drewna rezonansowego w Polsce. **[Areas of Spruce and Fir suitable for making musical instruments in Poland.]** *Sylwan* 103 (9), 1959 (61–72). [Pol.]

Four of the main Spruce and Silver Fir montane forest areas in Poland were explored to determine the amounts of wood suitable for making musical instruments. The results, tabulated for each region, show an approximate total of 5261 cu. m. of Spruce and 237 cu. m. of Fir, i.e. 0·152% and 0·001% respectively of the total standing volume of these species in the areas surveyed.

838. Vehicles (including Ships, Boats, Aircraft)

2430. Stricker, R. Mogućnost zamjene borovine smrekovinom u brodogradnji. **[The possibility of replacing Pine by Spruce in shipbuilding.]** *Drvna Ind.* 9 (7/8), 1958 (101–4). [Croat.g.] P.R.

In view of the increasing shortage of Pine in Jugoslavia, the possibilities are discussed of achieving a satisfactory degree of impregnation of Silver Fir, and especially of Spruce, to make possible the use of these species in jobs involving contact with or immersion in water.

839.8. Industrial Waste Wood, its Processing and Uses

See also Nos. 2466, 2529, 2539, 2548, 2550.

2431. Risi, J. L'utilisation des résidus forestiers et de sciage. **[Utilization of forest and sawmill waste.]** *Bull. Serv. For. Québec* (*n.s.*) No. 16, 1959. pp. 42 + 27 photos, 6 dgms. 30 refs. [F.]

Largely a review of work published by the Forest Products Laboratory at Ottawa, covering machinery for barking, chipping, transport etc. of woodwaste, as well as actual uses.

2432. McBride, C. F. **Utilizing residuesrom f Western Red Cedar mills.** *For. Prod. J.* 9 (9), 1959 (313–6). 7 refs.

A study carried out by the Canadian Forest Products Laboratories showed sawdust and solid residues to average 18·7 and 18·3% of cubic volume in three sawmills, and 32·7 and 27·1% respectively at two shingle mills, exclusive of bark. At present little of this is used, as the market for chips is restricted, but one company makes sawdust briquettes and refines them to charcoal, while others sell their solid residue for furniture, toys etc. [Cf. *F.A.* 21 No. 2520.]

2433. **Wood residue chip handling in the west—a review.** *Paper Tr. J.* 143 (14), 1959 (36–42). P.O.

A symposium with the following papers: Truck transportation of wood chips (*H. E. Lovejoy*); A cursory glance at the development in rail transportation of wood chips (*L. J. Forrest*); Chip compaction developments (*J. Gruenfeld*) [the use of high-pressure pneumatic systems in loading railway trucks to increase content by weight per truck]; [Methods and equipment in] weighing and dumping of chips at Cascade kraft mill (*R. P. French*); and How Simpson Paper Co. standardizes chip specifications (*J. C. Robinson*) [lists specifications for species, chip size and dirt (i.e. bark, rotten wood and charcoal)].

2434. Samuels, R. M., and Glennie, D. W. **Heartwood content of Douglas-Fir mill residues.** *For. Prod. J.* 9 (10), 1959 (384–5). 11 refs.

Describes a staining technique, using a 0·04% solution of bromcresol green in 50% ethanol to distinguish heartwood (h.w.) and sapwood chips. Veneer trim plus cores contained most h.w. The h.w. content of sawmill residues varied greatly.

2435. Sterlin, D. M. Suška izmel′čennoj drevesiny v lentočnyh sušilkah. **[Drying comminuted wood in belt-type driers.]** *Derev. Prom.* 8 (7), 1959 (7–9). [Russ.] P.R.

Discusses the theory of drying comminuted wood in belt-type driers, and a series of investigations by CNIIFM preparatory to designing one. The influence of air temperature on hourly drier output with different layer depths of comminuted wood, and the relation of power consumption to air speed at different layer depths are graphed. It was found to be far more efficient to blow air through, rather than over, the layers. Design drawings and brief specifications of the CNIIFM-14 belt-drier are given. It is a 5-belt vertical drier, charged at the top and discharged at the bottom. Output is 1200 kg. dry comminuted wood, moisture removal 1180 kg. and fuel consumption 515 kg. wood fuel, all per hour.

2436. Narayanamurti, D., and Sanjiva, U. **Note on the drying of sawdust.** *Norsk Skogind.* 13 (10), 1959 (361–2). 3 refs. [E.] P.R.

Results of experiments, in connexion with the manufacture of building boards, on drying in an infra-red tunnel the sawdust of *Cedrela toona* (fresh or treated with [unspecified] chemicals), *Dysoxylum malabaricum*, *Mangifera indica*, *Zanthoxylum rhetsa* and *Canarium strictum* are given in graphs and a table, showing the time taken and energy required for drying from 60 or 30 to 5% m.c. for various thicknesses of sawdust layer (0·08–0·45 in.). The treated dried more slowly than the untreated sawdust. The time of drying varied with species, initial m.c., and thickness of sawdust layer, from 5·5 to 159 min. and the energy required to evaporate 1 kg. of water from 0·8 to 13·67 KWH.

2437. Farber, E., and Hind, R. R. **Process for converting sawdust into fertilizer.** *For. Prod. J.* 9 (10), 1959 (340–4). 16 refs.

By heating sawdust in the presence of mineral acids, its carbohydrate content is reduced and its content of lignin and other non-carbohydrate matter increased. After incorporation of P, K, NH_3 and other nutrients, the substance is marketed as Fersolin, claimed to be a highly efficient soil conditioner and fertilizer carrier, providing both immediately and gradually available plant food, and requiring much less additional N than untreated sawdust.

84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyard Practice

841. Wood Preservation

See also Nos. 1850, 2396, 2404, 2422, 2427, 2430, 2457, 2461.

2438. Carvalho, A. de. Reflexões sobre a preservação de madeiras em Portugal. Contribuição dos métodos semi-industriais. **[Wood preservation in Portugal. The contribution of semi-industrial methods.]** Estudos e Divulgação Técnica, Secretaria de Estado da Agricultura, Direcção Geral dos Serviços Florestais e Aqüícolas, Lisbon. 1958. pp. 47. 17 refs. [Port.]

Reviews the present state of wood preservation in Portugal and concludes that there is room for extension of the hot-and-cold open-tank method and the Boucherie process. Equipment and methods used in these two processes are described.

2439. Preston, R. D. **The fine structure of wood with reference to impregnation [by water-borne preservatives].** *Timb. Technol.* 67 (2245; 2246), 1959 (459, 461–4; 503–8).

A review, dealing more particularly with conifer wood, but without precise citations of literature.

2440. Belford, D. S., *et al.* **The impregnation of timber by waterborne preservatives. I. General survey.** *Repr.* from *J. appl. Chem.* 9, 1959 (192–200). 7 refs.

Describes techniques and results of examinations of Douglas Fir impregnated with Tanalith C, by optical microscopy, polarization microscopy, X-ray diffraction analysis and electron microscopy, including electron diffraction analysis [cf. *F.A.* 19 No. 4907].

2441. Belford, D. S., and Cook, C. D. **The distribution of salts in timber pressure treated with a water-borne preservative.** *Wood* 24 (10), 1959 (411–2). 5 refs.

[Cf. *F.A.* 19 No. 4907.] Investigations using simple optical methods were made on Douglas Fir treated with Tanalith C. They showed that the preservative was lodged largely within the cell-wall, although deposits in the lumina undoubtedly occurred in the outer cells of the block. Results of electron microscope observations will be published later.

2442. McCarthy, D. F. **Project P.9. Properties of wood preservatives. Sub-project P.9–6. Laboratory tests on the toxicity and permanence of waterborne preservatives. Progress Report No. 5. The resistance to leaching in sodium carbonate-sodium bicarbonate buffer of some waterborne preservatives in sapwood blocks of *Pinus radiata* and *Eucalyptus regnans*.** Division of Forest Products, C.S.I.R.O., Melbourne. 1959. pp. 10 + [1] + 5 sets of gphs. 2 refs. Limited distribution.

Tabulates the results of investigations on the leaching resistance of 7 of 14 previously studied preservatives [cf. *F.A.* 17 No. 2092] using a $Na_2CO_3/NaHCO_3$ buffer solution at pH 9·2 as the leaching medium. Graphs are given indicating the leaching rates of the main toxic elements for leaching periods of 1000 hours.

2443. McGregor, G. H. **Immunisation of timber against attack by powder post beetle (*Lyctus brunneus*) with borates.** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 11 (3), 1958 (3–10). 4 refs.

[Cf. *F.A.* 20 No. 2462.] Briefly reviews earlier work, discusses the susceptibility of the sapwood of various hardwoods to *L. brunneus* attack, and describes the immunization processes used, with particular reference to the treatment of veneer.

2444. Carr, D. R. **The effectiveness of boron as a timber preservative—2.** *Timb. Technol.* 67 (2243), 1959 (371, 373–5). 14 refs.

[Cf. *F.A.* 21 No. 1084.] Discusses commercial methods of diffusion impregnation, treatment schedules and plant equipment, preparation of treating solutions, standards of treatment, etc.

2445. Wilson, W. J. **New spot tests for treated lumber.** *N.Z. Timb. J.* 6 (1), 1959 (69).

A new test for preservative-treated wood has been devised at the Forest Research Institute, Rotorua. The end section of a sample is sprayed first with solution A (0·2% pyrocatechol violet in distilled water) and then with solution B (phosphate buffer solution, pH $\nless 8$ and $\ngtr 8{\cdot}2$). Untreated wood gives a yellow reaction, boron-treated red, copper-chrome-arsenate blue, copper-zinc-chrome-arsenate blue, and acid-copper-chromate blue.

2446. WALTERS, C. S., and MEEK, W. L. **Assaying penta-treated wood by means of diazo compounds.** *For. Prod. J.* 9 (8), 1959 (251–7). 14 refs.

Experiments to find a test for the penetration of PCP (not its solvent) by coupling it with various aromatic amines to form a coloured compound are described, but the results of the colour tests on treated wood are not considered a clear improvement on current methods, all of which have drawbacks. Incidently, diazotized *o*-chloroaniline was found to have promise as a means of distinguishing heartwood from sapwood.

2447. STABNIKOV, V. N. Novye sposoby zaščity drevesiny. **[New methods of timber protection.]** *Derev. Prom.* 8 (10), 1959 (7–8). 5 refs. [Russ.] P.R.

A brief review of Russian work under the headings: (1) preparatory treatment of woods difficult to impregnate, using CH_3COOH and H_2SO_4 solutions; (2) ultrasonic treatment of wood during impregnation—20–400 kilocycles/sec. for 30 and 60 min. in aqueous and oily preservatives; (3) sterilization by γ-rays; (4) sterilization by gases—e.g. chloropicrin; and (5) treatment to make wood 'hydrophobic' (water-resistant)—methyltrichlorosilane solutions. Some of the basic experimental data and results (mainly successful but with some reservations) are given for each of the methods. Treatments (3) and (4) were to control *Coniophora cerebella* and *Merulius lacrymans*.

2448. GEWECKE, H. Über das Trogdrucksaugverfahren von Boucherie. **[The Boucherie steeping plus pressure-sleeve/vacuum-cap method.]** *Holz Roh- u. Werkstoff* 17 (10), 1959 (381–3). 3 refs. [G.g.e.] P.R.

Describes a virtually ignored patent of Boucherie (French Patent No. 11335, of 1854), covering a method of impregnation by applying pressure to one end of a barked pole and suction to the other. Further data [cf. *F.A.* 20 No. 1143] are presented to show that the addition of pressure in the trough-suction [i.e. steeping/vacuum-cap] process gives no advantage in impregnating barked logs.

2449. JONAS, G.-Z. Anwendungstechnische Untersuchungen über die Imprägnierbarkeit von *Aspidosperma quebracho-blanco*. **[Investigations on the possibility of impregnating *A. quebracho-blanco*.]** *Holz Roh- u. Werkstoff* 17 (9), 1959 (352–7). 8 refs. [G.g.e.] P.R.

As the Argentine railway authorities desire to use *A. quebracho-blanco* for sleepers, investigations were made on the possibility of impregnating the wood satisfactorily for this purpose. Experiments with small samples, and later with full-sized sleepers, showed that, for creosoting, the full-cell process gave good results if an additive such as 10% fusel oil was used. Impregnation by the full-cell process with a water-soluble salt solution (4% Basilit UA) also proved satisfactory.

2450. MILLER, R. J. **Preserving lumber in storage.** *For. Prod. J.* 9 (10), 1959 (390–4).

Reports on field trials on behalf of the Army on various species, air-dry or shipping-dry (60–80% m.c.), in five places in the U.S.A., with varying stacking, packaging, preservatives (oil and water-borne) and treatments. In tests still continuing, air-dry, bulk-bundled timber, after dipping in any of several preservatives for 10 minutes, developed no decay, and shipping-dry timber little decay in climates as severe as Hampton Roads, Va., and Anniston, Ala. A 5% solution of a mixture of NaF, K bichromate, Na arsenate, and DNP (water solvent) prevented decay even in shipping-dry timber and was the most effective in controlling fungus stain.

2451. LIESE, W. **Report to the Government of India on Bamboo preservation and soft rot.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1106, 1959. pp. 37 + 17 photos. 20 refs. Limited distribution.

Gives a general account of (1) the preservation of Bamboos; (2) the incidence of soft rot in untreated and treated timbers, Bamboos, canes, and other cellulosic materials; (3) the use of the electron microscope in research on wood and Bamboo anatomy and preservation. There are appendices dealing with: (*a*) seasonal changes of moisture content in *Dendrocalamus strictus*; (*b*) results of cold-soak experiments with Bamboo; (*c*) results of treatments on Bamboo with a modified Boucherie method using (i) 3 different age groups and (ii) two different preservatives [cf. *F.A.* 15 No. 2967; 19 No. 4910]; (*d*) the natural durability of Indian wood species against soft rot; (*e*) the effects of different wood preservatives against soft rot.

2452. HARTLEY, C. **Biological factors influencing the effectiveness of wood preservatives against decay.** *Applied Microbiology, Baltimore* 6 (3), 1958 (207–11). 37 refs. L.S.

Reviews the literature, and recommends further laboratory tests of preservatives, using the most common and widely distributed fungi, and field trials involving exposure to a representative sample of the local microbial populations, not merely those rotting wood but moulds and soil organisms that may aid or hinder the decay fungi.

2453. MCQUIRE, A. J. **Limitations imposed by some water-borne preservatives on the soil block test method for timber.** *Nature, Lond.* 184 (4696), 1959 (1430). 1 ref.

Loss of weight in sound blocks of wood treated with some water-borne preservatives (e.g. Cu/Cr/As, Cu/Cr/Zn/As, F/Cr/As-phenol, and H_3BO_3) was found to be due to soluble-salt removal by diffusion. The implications of the phenomenon are discussed.

2454. RENNERFELT, E. Några synpunkter på laboratorieundersökningar av träimpregneringsmedel. **[Laboratory testing of wood preservatives.]** *Svenska SkogsvFören. Tidskr.* 57 (3), 1959 (469–74). 4 refs. [Sw.e.]

When samples from a sleeper (freshly but not very well creosoted) were tested (*a*) by the usual soil-block method (i.e. laid on the soil), (*b*) by a modified technique (burying them in the soil), weight losses were considerably greater in (*b*) for both treated and untreated material. Moisture content, particularly in untreated or poorly impregnated samples was also higher in (*b*). In another series of tests using method (*a*) only, *Polyporus kymatodes* and *Poria sericio-mollis* attacked untreated Pine sapwood more severely than the traditional test fungi *Lentinus lepideus* and *Poria vaporaria*, but *P. sericio-mollis* did not seriously attack heartwood.

2455. Roff, J. W., and Shen, H. **Loss in stiffness evaluates decay resistance of wood treated with copper naphthenate.** *For. Prod. J.* 9 (8), 1959 (262–5). 14 refs.

In strength tests made on small beams (120 × 4 × 7 mm.) of Western White Pine heartwood treated by dipping into Cu naphthenate solutions of varying strength and exposed to decay fungi in test jars, marked increases in the rate of deflection were recorded when an intermittent load of fixed value was applied *in situ* at weekly intervals during a 4-week period. The method was more sensitive than weight tests, and is considered suitable for non-pressure treatments. A similar, but much smaller increase occurred in uninfested controls. A high concentration was found necessary to inhibit certain fungi associated with decay in boats. A retention of 0·002 lb. Cu/sq. ft. was required for the inhibition of *Lenzites trabea*, followed in increasing order of tolerance by *L. saepiaria*, *Fomes roseus*, *Poria xantha*, *P. incrassata* and *P. monticola* (requiring 0·009 lb.).

842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies

See also No. 2447.

2456. **Simple chemical treatment cuts shrinkage of green wood.** *Sth. Lumberm.* 199 (2484), 1959 (32–3).

Discusses applications by brushing and soaking of polyethylene glycol 1000 [cf. *F.A.* 17 No. 4505] to prevent splitting and checking in short thick pieces made of partially pre-curved green wood. In Southern Pine, heartwood required heavier applications than sapwood because of poorer absorption. Walnut gunstocks, soaked for 4 weeks, withstood fast kiln-drying without damage. Small art carvings were successfully treated by a 24-hr. soak in a 33% aqueous solution. A polyurethane varnish gave a fast drying finish. Varnish or other coats are necessary to prevent leaching.

2457. Stamm, A. J. **The dimensional stability of wood.** *For. Prod. J.* 9 (10), 1959 (375–81). 19 refs.

Describes detailed tests with polyethylene glycol [molecular weight] 1000 [p.e.g.] by brushing or soaking, with varying concentrations, durations, or replications, on wood (solid or veneer) of different moisture contents, the species used including Southern Pine, Sitka Spruce, Douglas Fir, and Yellow Birch. A p.e.g. content of 13% (of weight of oven-dry wood) prevented splitting in 1·25-in.-thick disks cut from green Sitka Spruce. A 10% content in Douglas Fir veneer greatly reduced, and ≥ 20% practically prevented face checking in plywood made therefrom. Rate of diffusion was slow, suggesting that green boards would need 10–15 days' soaking, and the bulking effect in woods that had reached equilibrium moisture content at 30, 65 80 and even 90% relative humidity was small compared with that in green wood. Toughness was not impaired by even quite high retention. Strength in static bending and abrasion resistance were somewhat reduced, but no more than would be expected from the bulking of the fibres. Retentions of 17·6% p.e.g. prevented decay by *Lenzites trabea*. As p.e.g. was non-toxic in culture tests, its effect is attributed to lack of water in the bulked fibres. Glue joints, particularly with casein, cold-setting urea and hot-setting phenol resins, were quite strong even with retentions of 33%, and tests with various coats indicated that finishing was possible, but at greatly retarded drying rates. Tests indicated that a varnish best prevented leaching.

2458. Šejdin, I. A. Zubčatye kolesa iz nemetalličeskih materialov. **[Gear wheels from non-metallic substances.]** *Derev. Prom.* 8 (11), 1959 (17–8). [Russ.] P.R.

Reports the results of tests on gear wheels made of laminated wood, working on steel wheels. The wooden wheels were made of Birch plies 0·5–0·6 mm. thick, glued with phenol-formaldehyde resin and having an angle of 30° between the grain of adjacent plies. The rate of wear of these wheels in use is graphed for 800 hr., no wear at all being noted in the first 25 hr. Strengths were: bending in the glue-line plane 1550 kg./sq. cm.; modulus of elasticity in compression ∥ to the glue-line plane 1·95 × 10^5 kg./sq. cm.; Poisson's ratio in compression ∥ to the glue-line plane 0·37. The strengths of laminated Beech and of two plastics (tekstolit and polyamide), which are also used for gear wheels, are compared.

843. Fireproofing and Fire Resistance

2459. Dorn, H. Brandverhalten des Holzes mit und ohne Feuerschutz. **[The behaviour of wood in fire, with or without protective treatment.]** *Holz-Zbl.* 85 (123), 1959 (1641–2). [G.]

A lecture containing some data from recent tests at the Otto-Graf Institut, Stuttgart. Laminated beams of 16 × 40 cm. cross-section, exposed for 30 min. to a fire of up to 880° C., lost ca. 2 cm. thickness per face, but retained a strength of twice the permissible load. The mean compressive strength of wooden supports of ca. 14 × 14 × 100 cm., exposed to 1½ hours' fire of up to 1000°, remained well above the permissible load, when they had been coated with a loose layer of asbestos fibres 2·5 to 3·5 cm. thick, applied by a spraying process.

2460. Tibbetts, D. C. **Fire retardants for wood.** *Building Note, Division of Building Research, National Research Council, Ottawa* No. 33, 1958. pp. 8. 9 refs. P.R.

Discusses some proprietary flame-retardants listed by U.S. and Canadian underwriters, with details of chemical composition, applications and fire-hazard classification. The various effects of impregnation and surface-coating treatments (e.g. on woodworking tools, on strength of wood, on glues, paints and dyes; toxicity, corrosion of metal fastenings, etc.) are mentioned.

2461. Gooch, R. M., Kenaga, D. L., and Tobey, H. M. **Fire retardants for wood treated with oil type preservatives**. *For. Prod. J.* 9 (10), 1959 (325–9). 13 refs.

In laboratory and field tests a phosphorus/halogen mixture added to the preservative materially reduced fire-hazard associated with wooden railway trestles impregnated with oil-type preservatives. P as triaryl phosphate contributes materially to reduction of fire hazard. Halogen specifically reduces flame spread. PCP and 2,4,6-tribromoaniline appear to have properties that make them suitable as halogen carriers for this purpose.

2462. Oliver, A. C. **Fire retardant treatment of bobbins**. *Test Rec. Timb. Developm. Ass., Lond.* No. *C/TR*/4, 1958. pp. 4 + 3 photos.

Describes the treatment (hot-and-cold tank method with a 20% solution of $(NH_4)_2HPO_4$). Distortion of the bobbins (of *Betula lutea*) on drying was avoided by treating the blanks, which after machining retained adequate fire-retardant properties.

844. Attack by Plant Organisms

See also No. 2503.

844.1. Sap-staining and Mould Fungi

See also Nos. 2450, 2467.

2463. Knudsen, M. V. Misfarvning av bøgetræ. **[Discoloration of Beech wood.]** *Træindustrien* 9 (11), 1959 (136–8). 5 refs. [Dan.] P.R.

Discusses investigations begun in 1959 on the fungi responsible. Earlier Danish literature on discoloration and its control [cf. *F.A.* 18 No. 4730] is reviewed. Various types of discoloration in the green timber and in sawn timber (either developing in favourable conditions from infections already present before sawing, or appearing only after sawing, often under a clean surface and visible only after further conversion) are described with illustrations.

844.2. Wood-destroying Fungi

See also Nos. 1490–1, 1913–4, 1992–2001, 2359–60, 2413, 2447, 2450–5, 2463.

2464. Etheridge, D. E., and Morin, L. A. **A modification of the wood block decay test for studying imperfect fungi**. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (4), 1959 (1).

Tests are carried out with ¾-in. blocks of wood. A hole is bored, using a ¼-in.-diam. drill, to a depth of ½ in. in the centre of one of the tangential faces, the inoculum with the required amount of water is placed at the bottom of the hole, which is sealed with a glass rod, and the rate of development of the test fungus is measured by noting the number of days required for hyphae to grow through the ¼ in. of wood separating the inoculum from the surfaces of the block. The method has also proved advantageous in studying the minimum moisture requirements of fungi.

2465. Kawase, K. **[Chemical study of decayed wood. I.]** *Res. Bull. Exp. For. Hokkaido Univ.* 19 (2), 1958. pp. 330 + 4 plates. 166 refs. [Jap.e.*e.*]

The objects of this study were the chemical properties of decayed wood, methods of determining the degree of decay, and possible utilization of decayed wood for the manufacture of active carbon and pulp. Samples were taken of the 23 principal species decayed by 57 wood-destroying fungi from all over Hokkaido. These fungi were divided into 3 groups: (*A*) brown-rot type where decayed wood has a holocellulose/lignin ratio of < 1; (*B*) white-rot type with a high cellulose/lignin ratio; and (*C*) an intermediate type in which the ratio is near to that of sound wood. The following changes in wood properties were found in decayed wood: (*a*) weight decreased; (*b*) C contents of (*A*) were higher, of (*B*) lower than those of sound wood; (*c*) no change was found in H content at various stages of decay; (*d*) ash content increased in (*A*) and (*C*) but not in (*B*); (*e*) yield of extractives almost always increased, particularly in (*A*); (*f*) Cross and Bevan cellulose increased in (*B*), decreased slightly in (*C*) and considerably in (*A*); (*g*) total pentosan content decreased markedly in (*A*) hardwoods and (*B*) softwoods and hardwoods, but showed little change in others; (*h*) slight changes in methyl-pentosan content were found at various stages of decay; (*i*) holocellulose content increased in (*B*), decreased slightly in (*C*) and markedly in (*A*); (*j*) lignin content increased markedly in (*A*), decreased in (*B*) and showed little change in (*C*); (*k*) pH was slightly raised in all cases; (*l*) the volume of dilute alkaline solution absorbed by wood was increased in both (*A*) and (*B*). The lignin in (*A*) was more soluble and had lower C and OCH_3 contents than in sound wood. Cellulose, mannan and xylan in holocellulose were consumed preferentially, and the decayed material is therefore divided into 7 groups of softwoods and 5 of hardwoods according to the components of holocellulose. Another method of determining degree of decay by absorption of NaOH is described. The nail-holding power of decayed wood was measured and found to decrease with the progress of decay, and a regular relation between nail-holding power and volume of alkaline solution absorbed was observed. Hydrated active C was obtained from decayed wood by dehydration with H_2SO_4. Some C from decayed wood (notably *Abies sachalinensis* decayed by *Hirschioporus fusco-violaceus* and *Fraxinus mandschurica* decayed by *Stereum* sp.) had a high adsorptive ability. C from *Larix leptolepis* decayed by *Polyporus schweinitzii* had high ability to purify penicillin. Some active C was produced by the $ZnCl_2$ method from decayed wood samples, but did not prove very effective. Three species of wood (*Abies sachalinensis*, *Picea jezoensis* and *P. glehnii*, decayed respectively by *Stereum sanguinolentum*, *Cryptoderma yamanoi* and *Tyromyces borealis*) were digested by the sulphate process and gave yields of 45·7, 46·8 and 45·4% compared with 46·8 for sound *Abies mayriana*; %

holocellulose in pulp and breaking length were much the same as in sound wood. The results of all experiments are set out in 181 tables with English captions.

2466. JACQUIN, F., and MANGENOT, F. Populations microbiennes des bois. III. Humification *in vitro* d'une sciure de hêtre. **[Fungus populations in wood. III. *In vitro* humification of a Beech sawdust.]** *Plant & Soil* 11 (4), 1959 (376–91). 36 refs. [F.f.]

[Cf. *F.A.* 20 No. 3847.] *Trechispora* sp. (1), *Cytosporella* sp. (2), and two mixed natural inocula (3) were cultured on Beech sawdust to which peptone and mineral salts had been added. Fungus (1) acidified the medium, broke down the lignin, and produced a large number of pale humic compounds; (3) decomposed the lignin only slightly, and formed dark humic compounds. Both (3) and (2), in mixed culture with (1), provided an intermediate-type humus, and the exchange capacity increased considerably. These results are discussed, with reference to recent literature [cf. *F.A.* 20 No. 55].

2467. BALABÁN, K. Výzkum trvanlivosti zamodralého dřeva. **[Investigations of the durability of wood attacked by blue-stain fungus.]** *Sbornik Vědeckých Prací Fakulty Lesnické, České Vysoké Učení Technické, Praha* No. 1, 1958 (131–45). 21 refs. [Cz.russ.g.]

Reports laboratory and field investigations on the durability of *Pinus sylvestris* blue-stained by *Ophiostoma pini* (dead, sublatent or alive at time of test) when exposed to (1) *Gloeophyllum abietinum*, (2) *Lentinus lepideus*, (3) *Merulius lacrymans*, (4) *Coniophora puteana* and (5) *Poria sinuosa*. Damage, assessed by weight losses, was greater on blue-stained wood than on controls. With (2), (3) and (4), the difference in weight loss between blue-stained samples and controls was at a maximum at 1½ months, though weight losses continued up to 3 months. With (1), the max. difference occurred at 2½ months. After 3 months' exposure, weight losses of blue-stained samples were 54·5, 63·5, 65 and 39% respectively for (1), (2), (3) and (4), compared with 28, 54·5, 50·5 and 28% in controls.

2468. DILLER, J. D., and KOCH, E. J. **Weight losses of 40 wood species exposed to *Poria incrassata* and *Merulius lacrymans*.** *For. Prod. J.* 9 (9), 1959 (298–302). 10 refs.

Describes a method of outdoor testing carried out for 2 years at Beltsville, Md. on 200 plots, each 5 ft. square, in which wedge-shaped samples, 2 × 2 in. at the top and 8 in. long, were arranged in a circle on the ground round an inoculum bred from infected wood, placed under an inverted flower-pot (to simulate crawl-space conditions, notoriously favourable for these fungi) and covered with polythene and leaves as an insulation and moisture barrier. A vigorous fungal growth was maintained throughout the period, resulting in continuing weight losses of the samples, the only maintenance necessary being an occasional watering of the flower pot in hot weather. Six months after the start of the tests the soil was treated with DDT to prevent attack by wood-eating insects. *M. lacrymans* caused greater weight losses than *P. incrassata* though temperature conditions were probably not optimum for it. The differences in susceptibility varied considerably between species. Of 23 U.S.-grown species primarily tested, *Maclura pomifera* had the smallest and *Tsuga canadensis* the greatest weight loss, the latter being the only species in which heartwood was as susceptible as sapwood. Of 17 tropical hardwoods (tested less extensively), *Dalbergia nigra* lost no weight, and *Khaya ivorensis* most. Weight losses of the American species on the whole corresponded well to published results of field tests. There was no correlation with specific gravity, and no difference between hardwoods and conifers.

2469. RUDMAN, P. **Project P.13. The natural durability of timbers. Sub-project P.13–8. Variation in decay resistance within and between trees of the same species. Progress Report No. 1. Properties of "inner sapwood" of Spotted Gum (*Eucalyptus maculata* Hook.).** Division of Forest Products, C.S.I.R.O., Melbourne. 1959. pp. 6. 4 refs.

Untreated offcuts from 7 well-seasoned *E. maculata* poles of 6–8 in. diam. were examined for insect and fungal attack, tyloses, starch content and the boundaries between the three major zones, viz. heartwood (h.w.), an intermediate wood or inner sapwood (s.w.) (difficult to distinguish from true h.w. and often found in the green wood outside the h.w. in *E. maculata*), and s.w. proper. Exposure of the samples to air and light resulted in a lightening of colour from a shade similar to that of h.w. to that of s.w.; starch granules were present in s.w. and inner s.w., decreasing in quantity on approaching the h.w. Tabulated results of decay tests with *Coniophora cerebella* indicate that, as expected from previous laboratory tests with wood blocks [cf. *F.A.* 19 No. 4936], both the s.w. and inner s.w. were susceptible, and the h.w. moderately resistant, to decay, though the narrow dark band sometimes found at the inner s.w./h.w. boundary was as resistant as h.w. The tabulated %s of extractives in each zone show low values for s.w. and inner s.w. compared with h.w., chromatograms indicating that, though distinct from s.w. and h.w., the inner s.w. is more closely related to s.w. However, it is concluded that there is no justification for regarding the inner portion as "intermediate wood", inner s.w. being considered its most appropriate description in view of its chromatographic dissimilarities with outer s.w. The whole of the s.w. is clearly susceptible to decay and must be preservative-treated for use in the open, examination of creosoted samples indicating penetration of inner and outer s.w. as might be expected from the absence of tyloses.

2470. RUDMAN, P., and COSTA, E. W. B. DA. **Variation in extractive content and decay resistance in the heartwood of *Tectona grandis* L.f.** *J. Inst. Wood Sci.* No. 3, 1959 (33–42). 12 refs.

The relationship between age, rate of growth, extractive content, and decay resistance of Teak heartwood (h.w.) has been studied and the results emphasize the wide range of variation in decay resistance, both between trees and within a single tree. H.w. resistant to *Coniophora cerebella* is usually found within 5 to 10 growth rings from the pith, but in one tree none was found in the first 40 growth rings. *Coriolus* [*Polystictus*] *versicolor*, which may not be so important a hazard in service, was much more destructive to Teak under laboratory test conditions than *C. cerebella*. A significant degree of correlation has been demonstrated between decay resistance of Teak h.w. and age, rate of growth and extractive content; scatter diagrams and correlation analyses are presented to illustrate these relationships. Its natural decay resistance has been shown to be due to the presence of extractives, since ether/methanol-extracted Teak is decay-susceptible. After extraction, however, samples from most trees exhibited an increase in decay resistance from the pith to the sapwood, and it is suggested that this residual gradation in decay resistance is due to a gradual change either in cell-wall composition or in structure as the tree becomes older, which, having no relation to extractives, operates in sapwood as well as in heartwood. This change is not reflected in any change in basic sp.gr., which showed no corresponding gradation in the 2 trees on which it was measured.

2471. SMITH, D. N. **The natural durability of timber.** *Rec. For. Prod. Res., Lond.* No. 30 (rev.) 1959. pp. 26. Price 2*s*. 0*d*.

[Cf. *F.A.* 11 No. 354.] Results to date are given for ca. 130 species under test for the last 25 years, with a durability classification; also a graph showing the estimation of average life in terms of the % of specimens rejected for decay.

2472. DANIELSEN, A. *Pholiota squarrosa* Müll. og *Trametes gibbosa* (Pers.) Fr. på bøkevalser i ullvarefabrikk ved Ålesund, Norge. **[*P. squarrosa* and *T. gibbosa* on Beech rollers in a woollen mill at Ålesund, Norway.]** *Friesia, København* 6 (1/2), 1957/1958 (1959), (4–6). [Nor.e.] L.S.

The fungi were growing on two rollers (one on each) of the same machine. The mill with constant temperature and humidity (22° C. and 65%) provided optimum conditions. *P. squarrosa* is common and may have established itself after the roller reached the mill but *T. gibbosa* is rare and confined to the S.E., and the roller was probably infected before it was imported from Germany.

2473. LIESE, W., and PECHMANN, H. VON. Untersuchungen über den Einfluss von Moderfäulepilzen auf die Holzfestigkeit. **[Investigations on the influence of soft-rot fungi on wood strength.]** *Forstwiss. Cbl.* 78 (9/10), 1959 (271–9). 12 refs. [G.g.]

Samples of *Betula verrucosa* (8·5 × 8·5 × 120 mm.) were exposed to *Chaetomium globosum* and *Trichoderma viride* for 15, 30, 45 . . . 90 days, after which their weight losses, modulus of elasticity, and breaking strength in impact tests were measured. Even after the longest exposure, maximum weight losses were relatively small: with *C. globosum* 3%, and with *T. viride* 6·8%. This was probably due to the low wood moisture content in the tests, viz. 35–45%. Nevertheless, these maximum weight losses caused decreases of 30% and 57% respectively in impact strength. With both fungi the impact resistance decreased significantly with increasing weight loss; the modulus of elasticity was less affected. *T. viride* caused a greater loss in strength than *C. globosum*, for the same loss in weight.

2474. BJÖRKMAN, E. Om betingelserna för lagringsröta i stacklagrad barrvedsflis. **[Conditions for storage rot in piled conifer chips.]** *Svenska SkogsvFören. Tidskr.* 57 (3), 1959 (347–56). 5 refs. [Sw.e.*e*.]

Laboratory experiments with various decay fungi on Pine chips indicated that fungal growth, fastest at 20–25° C., fell off sharply at ca. 35°, and was markedly affected by moisture content and availability of O. Temperatures inside a 12,000-cu. m. pile at Skinnskatteberg in Central Sweden were found to reach 50–60° at depths of 2·5–6 m. in summer and autumn, and it is thought that these temperatures (caused by organic oxidation processes) and lack of O (which was not, however, confirmed by measurements) account for the remarkably good state of preservation often found in chips piled in the open.

2475. Abtöten von Holzschädlingen im Hochfrequenzfeld. **[Control of wood-destroying organisms [animals and plants] by HF.]** *Holz-Zbl.* 85 (132), 1959 (1769). [G.]

Describes apparatus that allows HF treatment of the interior of wood to be combined with heat treatment (e.g. by infra-red) of the surface so as to obtain the higher surface temperatures required for, e.g. the control of *Merulius lacrymans* spores. [Cf. *F.A.* 15 No. 3003; 18 Nos. 1069, 1074.]

845. Attack by Animals

See also No. 2475.

845.1. Marine Borers

See also No. 2143.

2476. OLIVER, A. C. **Use of X-rays in the detection of *Teredo* in wood.** *J. Inst. Wood Sci.* No. 3, 1959 (47–52 + 4 photos). 3 refs.

Describes a rapid technique used to detect *Limnoria* and *Teredo* attack in test samples extracted from Shoreham Harbour. Difficulties in the technique and means of avoiding them are considered, and a comparison with other methods (e.g. cross-cutting and visual) is included. It is concluded that the X-ray method provides a quick, easy, and reliable technique for assessing the extent of *Teredo* attack on sample wood blocks. The method is non-destructive and does not necessitate permanent withdrawal of sample blocks at inspections. The rate of attack can be studied over a period in individual test blocks, and not just assessed at a particular moment in time. It is probable that all marine wood-boring insects can be detected by X-rays.

2477. OLIVER, A. C., and WOODS, B. P. **A study of the natural resistance of certain timber species to marine borers [in Shoreham Harbour]. Interim report.** *Test Rec. Timb. Developm. Ass.*, *Lond.* No. *B/TR/*1, 1957. pp. 9 + 2 tbls., 3 photos. 5 refs. Price: 3*s.* 6*d.*

Two species (*Dicorynia paraensis* and *Cylicodiscus gabunensis*) are rated as highly resistant, and three (*Afrormosia elata*, *Sarcocephalus diderrichii*, and *Xylia dolabriformis*) as partly resistant to *Teredo* and *Limnoria* attack after 6 years' immersion; the remaining 19 hardwoods are rated as susceptible or highly susceptible. [Cf. *F.A.* 20 No. 5271.]

2478. EDMONSON, C. H. **Observations on the resistance of natural timbers to marine wood borers.** *Corrosion, Houston* 13, 1958 (33–6). From *abstr.* in *Prev. Deterior. Abstr.* 17 (1), 1959 (*Wood* 5, *PDL* 30069). P.R.

Discusses the inherent resistance to *Teredo* and *Limnoria* attack of certain alkaloid-containing woods, notably Greenheart, *Eusideroxylon zwageri*, Lignum Vitae, and the barks of *Araucaria* spp. Woods of $> 0{\cdot}5\%$ SiO_2 content (including *Dicorynia paraensis* (2·92%), *Syncarpia laurifolia* (1·23), *Metrosideros petiolata* (0·89), *Licaria macrophylla* (3·1), and *Antidesma pulvinatum* (3·3)), generally show high borer resistance. The postulated mechanisms of SiO_2 protection include mechanical abrasion (based on the fracture and attrition of the teeth of teredo shells on contact with siliceous wood) and metabolic effects (non-dissolution of SiO_2 in the alkaline media in the digestive tract, and consequent interference with normal metabolic processes).

845.2. Terrestrial Borers

See also Nos. 1913–4, 2114, 2130, 2443.

2479. WHITE, M. G. **The status of the house longhorn beetle [*Hylotrupes bajulus*]. Reassessment of the position in Britain.** *Timb. Technol.* 67 (2244), 1959 (406–9,411). 11 refs.

[See *F.A.* 15 No. 3007.] Brings the records up-to-date (1959) and discusses the prospects of the spread of *H. bajulus* both in areas where it is already established, and in those where only isolated occurrences are known.

2480. KÖRTING, A. Biologische Untersuchungen über die Entwicklung von *Hylotrupes bajulus* L. (Hausbockkäfer). **[The development of *H. bajulus*.]** *Mitt. Biol. Bundesanst. Land- u. Forstw., Berl.* No. 96, 1959. pp. 35. 23 refs. [G.g.]

Describes laboratory experiments on larvae developing in Spruce or Pine sapwood of 14–17% m.c. at room temperature, paying special attention to the problem of weight losses in larvae; these were often, but not always, associated with pupation. There was a slight difference between weight gains in Spruce and Pine, Spruce apparently being slightly more nourishing. Development times of 9 larvae varied from 1¾ to over 3 years. It is estimated that, of an original population of 100 larvae, each weighing 13–26 mg., $\ngtr$ 16 would reach a weight of 400 mg., the others dying or pupating at lesser weights. The total wood consumption of such a population is estimated at over 4000 c.c.

2481. BLETCHLY, J. D., and FARMER, R. H. **Some investigations into the susceptibility of Corsican and Scots Pines and of European Oak to attack by the common furniture beetle, *Anobium punctatum* Deg. (Col. Anobiidae).** *J. Inst. Wood Sci.* No. 3, 1959 (2–20). 30 refs.

[Cf. *F.A.* 21 No. 1126.] Reviews literature on the nutritional value of wood to *A. punctatum*, which shows that marked zoning effects exist in the sapwood (s.w.) of many species, and that freshly seasoned timber is probably more nutritive than wood long in service or in store. To explain the view commonly held in Britain, that *Anobium* attacks only older wood, studies were made in which single logs of Corsican and Scots Pine, and European Oak were submitted to chemical analysis. A decreasing N gradient from the periphery inwards was detected at the butt end, and less N content in the outer s.w. zone at the crown end than at the butt end in Corsican and Scots Pine. The distribution of nitrogenous substances is probably more important thatn the resin content in determining the rate of gain in larval weight, and the removal of resin from Scots Pine and of tannin from European Oak proved beneficial to larval nutrition. Experiments with wood extracted with water indicated that, besides being a cell-wall feeder, the insect also utilizes cell contents, which may account for the higher nutritive value of freshly seasoned wood. The lesser susceptibility of kiln dried than air dried Scots Pine s.w. probably results from chemical changes in cell contents after kiln drying. More detailed biochemical studies are needed to clarify the role of wood constituents, particularly the forms in which N is present or available, and the significance of vitamins (if they occur). *From authors' summary.*

2482. MATHUR, R. N. **Clump-curing of Bamboos [*Dendrocalamus strictus*] and susceptibility to powder-post beetle attack.** *Indian For. Bull.* (*n.s.*) No. 221, 1957. pp. 19. 3 refs.

A study was made of the effect of simple clump-curing (i.e. cutting the culms and allowing them to stand upright in the clump with all their side branches and leaves, for certain periods, to dry) on infestation by *Dinoderus* spp. The results indicated that clump-curing was ineffective in protecting culms from beetle attack.

2483. THOMAS, A. M., and WHITE, M. G. **The sterilization of insect-infested wood by high-frequency heating. 1. [H.F. heating.] 2. Tests with stray-field heating. 3. Test results.** *Wood* 24 (10–12), 1959 (407–10; 449–51; 487–8). 11 refs.

[Cf. *F.A.* 12 No. 3206; 18 No. 1074.] (1) An experimental set-up for H.F. disinfestation of wood is described, and results given of the temperature rise of wood blocks as a function of the strength and time of uniform (transverse) field heating. Prepared blocks of *Quercus robur* infested by *Lyctus brunneus* were exposed to H.F. currents, and results tabulated. It was concluded that 100% larval mortality is ensured if the wood reaches a temperature $> 65°$ C. within $\nless$ 40 sec. Further tests indicated that temperatures necessary to kill *Lyctus* larvae are more than adequate to ensure beetle mortality.

(2) The temperature distribution in wood exposed to stray-field heating was determined, and insect

mortality investigated. After a temperature of ⩾ 70° was obtained by 3 periods of 30 sec. exposure, all save one of 699 larvae infesting 28 blocks were dead. The effects of stray-field heating on surface finishes (wax polish, cellulose, French polish) were also determined.

(3) Discusses general conclusions, advantages and possible practical applications of H.F. heating in disinfestation, power requirements, etc.

2484. Akindinov, M. V. Himičeskie sposoby zaščity drevesiny ot porči. **[Chemical methods of protecting wood from insect damage.]** *Lesn. Prom.* 1959 (10), (14–7). [Russ.russ.]

An account of controlled experiments with BHC and DDT (dusts, suspensions, and mineral-oil emulsions) applied to ca. 10,000 cu. m. of conifer logs (Spruce, Larch, Pine, Fir) stacked in the forest and at riversides. The most effective treatments were a 1% mineral-oil emulsion (m.o.e.) of BHC and a 12% BHC dust, then a 1% m.o.e. of DDT and a 10% DDT dust. The toxicity of DDT and BHC was impaired more by solar radiation than by any other climatic factor. Illumination of the stacks within the range 2000–8000 luxes did not cause any considerable reduction in toxicity, but at ⩾ 8000 luxes, repeated application of the insecticides was necessary. General recommendations are made on the protection of logs stacked in the forest.

2485. Brown, K. W. **Control of ambrosia beetles in logs.** *Tech. Note For. Dep. Uganda* No. 76, 1959. pp. 4.

The effectiveness of dieldrin (2% in diesel oil or in water), Protostan 1/8 in diesel and Hexastan 1/9 in water (proprietary preparations containing BHC as the active insecticidal agent and Protostan also containing chlorinated phenols) was tested on barked and unbarked logs of *Bosqueia phoberos* and *Antiaris toxicaria* in the forest. Results are tabulated. They suggest that BHC is more effective than dieldrin, and diesel oil than water. The dieldrin in oil or water gave reasonable protection, though probably insufficient for high-grade timber production, for 4–8 weeks. Protostan gave excellent protection to *Antiaris* logs and would probably be equally effective for other species. Further research on Protostan and Hexastan is needed. [Cf. *F.A.* 20 No. 5274.]

2486. Roonwal, M. L., Chatterjee, P. N., and Thapa, R. S. **Prophylactic efficacy of various insecticides in the protection of freshly felled and converted timbers (planks) against insect borers.** *Indian For. Bull.* (*n.s.*) No. 215, 1959. pp. 45. 9 refs. Price *Rs.* 4.12 (6*s*. 6*d*.).

Summarizes the results of experiments carried out at Dehra Dun from 1944 to 1954, some of which have not previously been published. The most promising treatments are: (1) 0·5 or 1·0% γ-BHC in kerosene oil sprayed on logs; (2) 0·8% γ-BHC emulsion in water sprayed on logs; (3) brushing with coal-tar creosote (alone or diluted 50/50 with fuel oil).

2487. Benson, R. B. **The sawfly, *Ametastegia glabrata* (Fallén) (Hym. Tenthredinidae), damaging the timber of new schools in Warwickshire.** *Ent. mon. Mag.* 95 (1140), 1959 (119).

At least 7 different schools had their cladding (mostly *Thuja plicata* but in one case *Pseudotsuga taxifolia*) riddled with burrows made by the prepupae of *A. glabrata.* It is suggested that this sawfly was particularly frequent after the wet summer of 1958, especially on sites where, as round new buildings, its chief food plant, dock, abounded.

845.3. Termites

2488. Lund, A. E. **Subterranean termites and fungi. Mutualism or environmental association.** *For. Prod. J.* 9 (9), 1959 (320–1). 6 refs.

Laboratory experiments on Southern Yellow Pine sapwood to test the hypothesis that termites were always associated with fungi, produced attacks by *Reticulitermes virginicus* or *R. flavipes* within 24 hours on wood free from fungus infection. Blocks exposed for 12–20 days became fungus-infected.

2489. Schultze-Dewitz, G. Wie frisst die Termite? **[How do termites eat?]** *Holz-Zbl.* 85 (135), 1959 (1813). 12 refs. [G.]

Termites generally attack in the tangential direction, i.e. || to the annual rings, with the body of the animal lying || to the grain, and prefer early wood. The mean width of a bite in Pine wood was 0·3 mm. in early wood and 0·23 mm. in late wood.

847. Drying (Seasoning)

See also Nos. 2272–5, 2320, 2392, 2407, 2412, 2422, 2435–6, 2551.

2490. Truman, A. B. **Variation of moisture content of pulpwood piled in the bush.** *Pulp Paper Mag. Can.* 60 (11), 1959 (151 . . . 159). 1 ref.

Studies of the m.c. of standing Spruce (*a*) and Balsam Fir (*b*) showed that the distribution of moisture in the tree changed little throughout the summer. For (*b*) the max. variation was 4½%, for (*a*) 6½. The difference in m.c. between the top and bottom of the standing tree was 13% in (*b*) and 5% in (*a*). Measured on a gravimetric basis, the mean summer m.c. values were 56·5 and 42·8% for (*b*) and (*a*) respectively; measured volumetrically 30 and 24%. No difference was found in the rate of drying of logs when averages by month of cut were compared. Logs with the smallest diameters dried out fastest. In one year, the m.c. of (*b*) logs fell from 55·25 to 41·75%, and that of (*a*) logs from 41·5 to 28·25%. Corresponding weight losses were 25% (*b*) and 19% (*a*). *From author's summary.*

2491. Brown, W. H. **Influence of pile roofs on degrade.** *Timb. Technol.* 67 (2244), 1959 (410).

Discusses the advantages of roofing stacked timber in yards, viz. reduction of degrade, more uniform and apparently more rapid drying, and rapid recovery of the capital invested in such roofs (e.g. a roof costing £9 should pay for itself after five 90-day drying periods when used to cover 1-in. No. 1 common timber (or better) in a stack measuring ca. 15 × 8 ft.

2492. **Air-seasoning of lumber speeded by new system.** *Sth. Lumberm.* 199 (2484), 1959 (36 . . . 42).

Describes the "Fan-Air" pre-drying installation in which a battery of fans, controlled by "humidistats", send outside air through lumber stacked in tent-like or permanent structures. In 7-day tests at Memphis (Tenn.) in September, 1-in. "Poplar" [*Liriodendron tulipifera*] was dried from 95 to 19·4% m.c., Sap Gum [*Liquidambar styraciflua*] from 82·5 to 28·7%, etc.

2493. JASINSKIJ, V. S. Issledovanie ėffektivnosti suški drevesiny v doskah i v zagotovkah. **[Investigation of the efficiency of drying wood in [the form of] planks and blanks.]** *Derev. Prom.* 8 (6), 1959 (14–6). 1 ref. [Russ.] P.R.

Softwood and Beech to be used in making furniture were kiln-dried as (*a*) planks, and (*b*) blanks, and the yields of furniture parts, rejects in seasoning, and the costs of making the furniture parts were determined for both methods, and compared. Yields of furniture parts were greater from (*a*) than from (*b*), especially with Beech. Seasoning costs were less for (*b*) than for (*a*), the difference being greater with Beech than with softwoods. Total costs per unit volume of finished furniture parts were 19·9% (softwoods) and 24·6% (Beech) less for (*a*) than for (*b*).

2494. KEER, G. A. **Trends in kiln design.** *Wood* 24 (12), 1959 (500–2).

Gives details of 4 new British-made kilns. It is thought that small portable types of kiln are becoming more important, and that designers are concentrating on the cross-shaft kiln, fan size, fan drives, materials used in kiln building, and automatic control.

2495. MALMQUIST, L., and MEICHSNER, H. Betriebsmessungen an Kanaltrocknern mit Querbelüftung. **[Investigations on the work of cross-circulation tunnel kilns.]** *Holz Roh- u. Werkstoff* 17 (10), 1959 (384–96). 3 refs. [G.g.e.] P.R.

Measurements were made of air velocity, temperature, wood moisture content, and the power consumption of the ventilation motors in five recirculating, cross-shaft tunnel kilns. Mean air velocity above stack height varied with the kiln, the stacking, and the point of measurement, from 0·35 to 1·69 m./sec. In order to prevent or reduce degrade in export timber, max. dry-bulb temperatures of 50° C. and wet-bulb temperatures of 35° at the start of drying were not exceeded. The final mean m.c. from different kilns was 12·2–15·7% for side boards and 19·7–24% for planks. Total energy consumption of one kiln was ca. 830 Kcal./kg. of water removed, or ca. 1280 Mcal./standard; at another plant the values were 880–1010 Kcal. and 1160–1290 Mcal. respectively. Energy consumption increased with time, probably mainly owing to progressive corrosion in the heat-exchanger.

2496. MIKIT, Ė. A., and UPMANIS, K. K. Kamera dlja skorostnoj suški pilomaterialov peregretym parom. **[Kiln for rapid drying of sawn timber with superheated steam.]** *Derev. Prom.* 8 (8), 1959 (5–6). 1 ref. [Russ.] P.R.

Describes in detail, with plans, the design of a superheated-steam kiln in a Riga furniture factory. Green Pine boards 25 and 50 mm. thick can be dried in 24 and 40 hr. respectively. [Cf. *F.A.* 16 No. 1160; 18 Nos. 1086–7.]

2497. CAMPBELL, G. S. **Can chemical seasoning help the timber industry?** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 257, 1959 (1–3).

Gives some examples of successful chemical pretreatment of some refractory Australian timbers, e.g. of round wood of *Melaleuca* sp. with Carbowax, and of sawn boards of *Phebalium squameum* with a saturated salt solution.

2498. ASTAF'EV, B. A., BELOVA, E. I., and SMIRDIN, P. M. Suška drevesiny, propitannoj rastvorom povarennoj soli. **[Drying wood impregnated with a solution of ordinary cooking salt.]** *Derev. Prom.* 8 (3), 1959 (9–10). [Russ.] P.R.

Describes a successful process of preparing Beech blanks for lasts by steaming the green blanks for an hour, dipping them in a 25% salt solution for 4–5 min. (penetration 5–10 mm. tangentially and radially, 10–12 mm. along the grain), and then air- or kiln-drying. This treatment prevents checking and fungus attack during seasoning, and the salt-impregnated layer is removed when the lasts are shaped on the copying lathe.

2499. SERGOVSKIJ, P. S. Osobennosti suški drevesiny v židkih sredah. **[Features of the drying of wood in liquid media.]** *Derev. Prom.* 8 (5; 6), 1959 (5–8; 7–9). 8 refs. [Russ.] P.R.

[Cf. *F.A.* 16 No. 2402.] Discusses the equation of moisture transfer in drying, the characteristics of moisture movement in wood when dried in a gaseous medium and in a liquid, and the moisture equilibrium. An approximate equation is developed for the duration, *T*, of drying wood in a liquid:

$$T = \frac{qS^2}{8\lambda(t_l - t_b)} \cdot k,$$

where q is the specific heat expenditure in evaporating moisture from a unit volume of material; S, the thickness of the material (in m.); λ, the coefficient of thermal conductivity; t_l, the temperature of the liquid; t_b, the boiling point of water; and k is a correcting coefficient, value 1·2–1·3. The internal stresses in wood during drying in petrolatum are also discussed.

2500. UGOLEV, B. N., and ŠTEJNBERG, S. E. Vnutrennie naprjaženija v drevesine pri vysokotemperaturnoj suške v petrolatume. **[Internal stresses in wood during high-temperature drying in petrolatum.]** *Derev. Prom.* 8 (7), 1959 (11–3). 6 refs. [Russ.] P.R.

Pieces of flat-sawn Pine heartwood boards, of original m.c. 30–32%, were dried in petrolatum at 110 and 120° C. for periods ranging from 1 to 72 hr. The pieces were then held under room conditions for various periods (2 hr. to 17 days), small samples were extracted, and the compressive and tensile stresses measured for different parts of the boards. Diagrams of the stress states in the boards are given and discussed. It is concluded that the mechanism of the formation of internal stresses is basically the same in petrolatum-drying, kiln-drying, and natural seasoning. The special features of petrolatum-drying are the intensive moisture removal, and the increased plasticity of the wood at temperatures > 100°. The checking so common in petrolatum-drying can be avoided by the use of suitable schedules. The magnitude of residual stresses is no greater than in kiln-dried wood. The prime need now is to determine the optimum schedules for petrolatum-drying.

848. Timberyard Practice. Handling and Storage of Timber

See also Nos. 1852, 2491.

2501. LOWERY, D. P. **Techniques for evaluating log deck conditions.** *Res. Note Intermt. For. Range Exp. Sta.* No. 64, 1959. pp. 5.

Describes instruments and techniques used to measure temperature, relative humidity, pH of the moisture in the wood, circulation of air within the stack, depth of end checking, and location and species of fungus attack. [Cf. *F.A.* 21 No. 1150.]

2502. BRUBAKER, W. **End checking prevention methods. End sealers.** *Research Project, California Redwood Association, San Francisco* No. 3.22412 (*Interim Report C*), 1959. pp. 3. P.R.

To evaluate the cost factors involved in the use of 6 commercial end-sealers, 22 test units of "heavy segregation" flat-grain Redwood [see *F.A.* 20 No. 3879] with matching control units, were obtained by resawing 2-in. timber. These were then end-sealed, and air-dried to 40% m.c. before kiln drying. All boards were then examined for end checks and the end-sealers evaluated in terms of their % effectiveness in preventing loss through end checking. The results (tabulated) indicate that wax emulsion sealers are a cheap means of reducing end-checking; details are given of the net savings made per 100 boards and per 1000 bd. ft.

2503. ELLWOOD, E. L., and ECKLUND, B. A. **Bacterial attack of Pine logs in pond storage.** *For. Prod. J.* 9 (9), 1959 (283–92). 10 refs.

[Cf. *F.A.* 20 No. 5258.] A more detailed account, including control tests. Acidification to pH 2·7 was effective though not recommended because of corrosion effects. Tests with NaCl suggested that sea-water storage would be effective, but pending further research, deck storage under spray is recommended. [Cf. *F.A.* 20 No. 2294.]

85. Grading of Wood and Wood Products

851. Timber Quality in General

See also No. 1654.

2504. Skog og tre. **[Forest and timber.]** *Norsk Skogbr.* 5 (21), 1959 (571–6, 591 . . . 598, 600). [Nor.]

Extracts from papers read at the conference '*Skog og Tre*', on: the relation between forestry and the forest industry (*O. A. Rasch*); the need for revision of Norwegian forest fire precautions and control (*B. Strømsøe*); the effect of wood quality, especially density, in pulping (*H. P. Dahm*); the effect of quality in the timber industry (*C. J. Sommerfelt*); and the effect of silvicultural measures, especially thinning, on prices and quality (*L. Strand*).

2505. DADSWELL, H. E., WATSON, A. J., and NICHOLLS, J. W. P. **What are the wood properties required by the paper industry in the trees of the future?** *Tappi* 42 (7), 1959 (521–6). 16 refs. P.R.

[Cf. *F.A.* 20 No. 5320.] Discusses the preliminary results of studies on material from *Pinus* spp., *Araucaria klinkii* and *Eucalyptus* spp. on the influence of structural and chemical properties of the wood on pulp strength. The separate effects of cell length, cell-wall thickness and pentosan and lignin contents have been determined, keeping all other factors constant in each case. In this way, a marked increase in tearing strength with increase in cell length has been established in *A. klinkii*, and the effect of wall thickness on pulp properties other than tear has been emphasized with pulps from three species of *Eucalyptus* in which the mean cell lengths were identical. In *E. regnans*, pulp properties were satisfactory for a wide range (7–15%) in pentosan content. The presence of lignin was deleterious to all strength properties. In the species investigated the Cross and Bevan cellulose content increased through successive growth rings from the pith, reaching a more or less constant value after 6–8 years; it was also found to vary markedly in comparable material from different trees of a species. A method of sampling and determining wood properties in trees selected as possible parents in breeding work, designed to obtain a maximum of information from the smallest possible comparable samples, is described [cf. *F.A.* 16 No. 3340]. The properties determined were cell length, micellar angle, basic density, % late wood, cellulose content, maximum crushing strength etc., in successive growth rings or zones. After plotting mean and extreme values on the same graphs, results for individual trees can be added for comparisons.

2506. DADSWELL, H. E., and NICHOLLS, J. W. P. **Assessment of wood qualities for tree breeding. I. In *Pinus elliottii* var. *elliottii* from Queensland.** *Div. For. Prod. technol. Pap. For. Prod. Aust.* No. 4, 1959. pp. 16. 26 refs.

Describes a method for obtaining information on the wood characteristics of standing trees, based on the examination of specimens from 13 trees of *P. elliottii* selected for breeding purposes. The variation, through successive growth rings from the pith, of such features as cell length (c.l.), micellar angle (m.a.), basic density (b.d.), ring width (r.w.), % late wood, and longitudinal shrinkage (l.s.), was measured. Statistical analysis showed high correlations between c.l. and m.a.; % late wood and b.d.; r.w. and c.l.; and r.w. and b.d. Correlations between c.l. and l.s., and m.a. and l.s., were also found, which, though significant, were not large. The presence of compression wood did not affect the results. It was concluded that c.l., b.d., and l.s. give almost all the information required about wood characteristics in this species; the criteria for selection should be greater than average c.l., greater than average b.d., and l.s. as near to zero as possible. On the basis of a summation of the features examined, the 13 trees could be listed in order of merit. The incidence of spiral grain was also noted and 6 of the trees were then selected as best for breeding purposes; four were eliminated for spiral grain and for low values in other features. *From authors' summary*.

2507. JORANSON, P. N. **Improvement of hardwoods through genetics**. *Tappi* 42 (8), 1959 (691–700). 37 refs. P.R.

A general review and discussion of the genetic approach in (mainly) *Populus tremuloides* production, with special reference to pulp and paper technology.

852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 1913–4, 1917, 1922, 1924, 2368, 2463, 2502.

2508. KANO, T., EDAMATSU, N., and KABURAGI, Z. [**Quality of small sawlogs from the planted Cryptomeria (Report I). Knots in logs from Kamabuchi**.] *Bull. For. Exp. Sta., Meguro, Tokyo* No. 112, 1959 (49–113 + 7 photos). 10 refs. [Jap.jap.e.*e*.]

A study was made of 97 trees of *Cryptomeria japonica*, from an even-aged stand 51 years old. Detailed findings are given and discussed on distribution, number, length and angle of branch knots on logs; knots on the flat-grain surface; knots as a lumber defect; and knots on boxed-heart squares. The effect of knots on grading is discussed.

2509. **Included phloem in Kempas**. *Extr.* from *Rep. For. Adm. Malaya 1958*, 1959 (24–5).

Twenty-five logs of *Koompassia malaccensis* from swamp forests, and 16 from dry-land forests were examined to determine what influence, if any, habitat has on the frequency of included phloem in this timber, but no significant difference in this respect was observed between the two groups. It was, however, noted that, in general, logs from larger trees (irrespective of habitat) showed more included phloem than logs from smaller trees. Concentration of the defect was greater in the outer than in the inner layers of the log, and in heartwood of ca. 1-ft. diam. the defect was rare. The small number of observations, however, makes it impossible to draw any conclusions as yet from the study.

2510. KNIGGE, W., and SCHULZ, H. Methodische Untersuchungen über die Möglichkeit der Drehwuchsfeststellung in verschiedenen Alterszonen von Laubhölzern. [**Investigations on methods of determining the angle of slope of spiral grain in different age zones in broadleaved trees**.] *Holz Roh- u. Werkstoff* 17 (9), 1959 (341–51). 13 refs. [G.g.e.] P.R.

Investigations on *Quercus sessiliflora* and *Fagus sylvatica* showed that the angle was nearly the same for early and late wood in both species; spiral grain was at most 1·5° less in late wood than in early wood. The angle can be measured in the early-wood vessels of ring-porous species (e.g. Oak) by measuring the angle assumed by wire probes introduced into the vessels on a cross-section surface The angle can be measured in diffuse-porous, non-tylosic woods (e.g. Beech) by injecting colour into the vessels. Using both these methods it was found that in both species the angle of deviation from the stem axis might vary with the side of the stem, and sometimes varied irregularly with the age of the tree. Spiral growth observed from the bark or outer wood was not a reliable indication of the spiral grain within the tree. Spiral grain in the stem was not necessarily associated with similar spiral grain in the branches.

2511. MIYAJIMA, H., and OKUYAMA, H. [**Shrinkage values for Japanese Beech wood grown in Hiyama District, Hokkaido**.] *Res. Bull. Exp. For. Hokkaido Univ*. 20 (1), 1959 (209–38). 6 refs. [Jap.jap.e.*e*.]

Experiments were made on wood from one tree of 'red' and one of 'white' Beech (*Fagus crenata*) ('red' Beech being that with a large false heart and 'white' that with little or none). 'White' Beech wood was much denser and displayed greater shrinkage than 'red' wood with growth rings of the same width, owing to its greater % of late wood.

2512. **Brittle heart**. *Extr.* from *Rep. For. Adm. Malaya 1958*, 1959 (25).

Vertical distribution of brittle heart was studied in 49 trees of *Shorea leprosula*. The extent of brittle heart was generally greatest at the base (in a few trees at ca. 10 ft. above ground level), gradually tapering towards the top. In these trees, 80–90 ft. high, the highest point at which it was observed was 40 ft.

2513. HEISKANEN, V. Parkkiviat kesäaikana valmistetussa kuusipaperipuussa. [**Bark stains in Spruce pulpwood prepared in summer**.] *Metsät. Aikak*. 1959 (8), (278–82). 9 refs. [Fi.e.]

Pulpwood bolts, 4 m. long, were prepared at monthly intervals from April or May 1958 in 4 different localities, and stacked till autumn, when sample sections were taken from the middle, and in unbarked ones also at 30 cm. from the top, of each bolt. Bark stains were then determined in the laboratory. The chief results were: (1) a compound of H_2SO_4 and methanol was better than benzidine as a bark-stain indicator; (2) bark stain occurred more frequently in unbarked than in barked wood during forest storage, except with that prepared late in the summer; (3) most of the bark stain occurred in April–July in unbarked and in June–August in barked timber; (4) there was no difference in absorption of bark substances into the bolt, with varying bolt diameter, and as depth of bark stain is the same whatever the diameter, the % of bark-stained wood is always higher in thin than in thick bolts prepared at the same time. *From author's summary*.

2514. SORG, K. A. Der Einsatz von Metallsuchgeräten in der Holzindustrie. [**The application of metal detectors in the wood industry**.] *Holz Roh- u. Werkstoff* 17 (10), 1959 (397–402). 2 refs. [G.g.e.] P.R.

An account of principles, and a review of fixed and portable detection equipment of German, British, Swedish, American and French manufacture.

2515. LEE, I. D. G. **Non-destructive testing of wood by vibration methods**. *J. Inst. Wood Sci*. No.

3, 1959 (21–32 + 5 photos, 4 gphs.). 19 refs.
[Cf. *F.A.* 19 No. 4781.] Reviews some uses of sonic and ultrasonic vibrations in the non-destructive testing of wood, describing methods that enable elastic properties and internal friction of wood to be measured under varying internal and external conditions. Reference is made to their application in the selection and quality control of materials for manufactured articles, in measuring rates of fungal decay and degrade due to seasoning defects, ascertaining the structural safety of a damaged roof structure, and locating breaks in glue lines in laminated structures and components. *From author's summary.*

2516. MILLER, D. G. **Sonic detection of blisters.** *For. Prod. J.* 9 (8), 1959 (243–7). Also in *Wood* 25 (2; 3), 1960 (57–60; 101–3).
Describes experiments at Ottawa showing that hidden blisters (areas where there is no bond between two plies) and defective bonds, in plywood etc., can be detected by a device that responds to an increase in the level of the higher frequencies of the sound produced when a brush passes over a defective patch. Various experimental types with rotating and non-rotating brushes have been developed. One type with a non-rotating brush scanning across the direction of the feed at high speeds was capable of detecting a 6-in. blister 3 plies (i.e. $\frac{1}{2}$ in.) down in a 7-ply $1\frac{1}{16}$-in. Douglas Fir panel moving at 100 ft./min. through the machine, despite great mill noise. A device for marking defective panels by means of an electronic relay, constructed so as to respond to blisters of minimum size but not to permissible knot-holes, and a portable model for curved plywood etc. have also been developed.

853. Grading of Wood in the Rough

See also Nos. 2182–3, 2410.

2517. **Asia-Pacific regional grading rules for Teak logs.** FAO, Rome. 1959. pp. 52. Price $0.50 or 2*s.* 6*d.*

2518. **Asia-Pacific regional grading rules for hardwood logs other than Teak, produced by the region, except Australia, New Zealand and Japan.** FAO, Rome. 1959. pp. 28. Price $0.25 or 1*s.* 3*d.*

854. Grading of Converted Timber

See also Nos. 2327, 2410, 2420.

2519. FLEMMICH, C. O. **Some notes on the grading of sawn hardwood timber.** *Emp. For. Rev.* 38 (3), 1959 (268–77).
Discusses the grading of tropical undressed timber as produced by the ordinary mill, arguing that the specifying of defect-free timber is frequently an unnecessary and costly anachronism from a time when, on the one hand, more such timber was available, and, on the other, no proper grading rules or trained graders existed. Some notes on systems of grading, on terms and definitions, and various printed grading rules are given.

86. Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood

See also No. 2465.

2520. WETHERN, J. D. **Pulp and chemical potential for Western Red Cedar utilization.** *For. Prod. J.* 9 (9), 1959 (308–13). 11 refs.
Discusses the difficulties of finding outlets for large quantities of waste and low-quality logs of *Thuja plicata*, since low density, barking difficulties, dark colour, corrosive constituents etc., make it less suitable than other conifers for kraft and sulphite pulping and unsuitable for groundwood pulp, while the commercial utilization of the volatile oils and other extractives still calls for considerable research and development. [Cf. *F.A.* 21 No. 2432.]

861. Pulp and Paper Manufacture. Textile and other Cellulose Derivatives

See also Nos. 1623–4, 2282, 2286, 2289, 2335 *et seq.*, 2474, 2505, 2507.

2521. **A forecast of demand—the period to 1975.** [*Document*] *FAO World Consultation on Pulp and Paper Demand, Rome 1959* No. *FAO/WPPC*–59/2, 1959. pp. 79 + 21. [E.] Limited distribution.
Secretariat note, forecasting pulp and paper demand by regions, with explanations of the statistical methods used.

2522. **Developments of pulp and paper trade.** [*Document*] *FAO World Consultation on Pulp and Paper Demand, Rome 1959* No. *FAO/WPPC*–59/4 and 59/4:1, 1959. pp. 25 + 12 tbls. [E.] Limited distribution.
Secretariat paper giving world statistics by large regions.

2523. PARIAT, M. **Where does the pulp and paper industry stand in the general economy of the People's Democracies?** *Pulp Paper Mag. Can.* 60 (9), 1959 (100–11). Several refs. in text. Transl. from *Papeterie, Paris* March, April and May, 1959. [F.]
Analyses the position of the pulp and paper industry in the economies of the U.S.S.R., China, Poland, E. Germany, Hungary, Czechoslovakia, Bulgaria, Rumania and Jugoslavia, [omitting Albania, Outer Mongolia, N. Viet-Nam and N. Korea], with comparisons with non-communist countries.

2524. CHEN, L. **China: hopes pinned to grass fibres for growing industry.** *Pulp Paper Mag. Can.* 60 (11), 1959 (94–5).
Discusses developments and progress in China's pulp and paper industry, in which grass fibres (including Bamboo fibres), and not wood, will form the basic raw material.

2525. STONE, J. E., and GREEN, H. V. **Penetration and diffusion into hardwoods.** *Tappi* 42 (8), 1959 (700–9). P.R.
[Cf. *F.A.* 18 No. 2264.] Describes methods used for studying the pore structure of 19 hardwoods in relation to the penetration of liquids and the diffusion of ions. Tabulated data on the variability

between species of both forms of movement are given, and briefly compared with corresponding behaviour in softwoods.

2526. BRECHT, W. **Groundwood and chemi-groundwood from European Poplarwood.** *Tappi* 48 (8), 1959 (664–9). 16 refs. P.R.

[Cf. *F.A.* 20 No. 3914.] Reviews and discusses previous European work, and presents data on laboratory tests using various "mild" (notably the Weisshuhn) and "strong" (the Libby-O'Neill) chemical pretreatments. Reference is made to pioneer work being done in Canada and the U.S.A.

2527. EVANS, J. C. W. **Something new—in semi-chemical pulping of hardwood.** *Paper Tr. J.* 143 (34), 1959 (36–9). P.O.

A technical report on the Stora Brite-chem (neutral sulphite semi-chemical) process, for pulping Birch, used by Stora Kopparberg A.B. at Kvarnsveden, Sweden. Pulp yield is ca. 85%, brightness is considerably higher than the mill's Spruce groundwood and sulphite pulps, and strength is above that of the groundwood and near that of the sulphite. The pulp is used for 10–15% of the newsprint furnish.

2528. TOSAKA, K. **[Effect of prehydrolysis on properties of dissolving sulphate pulp.]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (1), 1959 (315–43). [Jap.jap.e.*e.*]

Betula platyphylla wood was used in these experiments. Prehydrolysis was performed with water, CH_3COOH, and H_2SO_4, in order to remove pentosans. Results obtained for different concentrations, temperatures and durations of treatment are tabulated in the English summary.

2529. MARTIN, J. S. **Pulping sawdust chips made by a coarse-feed saw.** *For. Prod. J.* 9 (10), 1959 (359–60).

Describes sulphate pulping tests at Madison, using sawdust chips from a 36-tooth circular saw [cf. *F.A.* 20 p. 489], screened into chips of ca. ¼-in. length (ca. 45% of the whole) and fines. Yield of kraft and bleachable sulphate pulp was about the same for the sawdust-chips as for ⅝-in. standard chips produced in a chipper from one and the same Southern Pine log, and slightly less for the fines. Bursting and tearing strengths for kraft and sulphate pulps respectively were 82 and 88% for the chips, and 59 and 72% for the fines, compared with pulps made from standard chips.

2530. KLAUDITZ, W., BERLING, K., and JACOBSEN, H. Über die Herstellung und papiertechnologischen Eigenschaften von Holzfaserstoffen aus Laubholz. **[The preparation and papermaking qualities of hardwood pulps.]** *Papier, Darmstadt* 13 (13/14), 1959 (287–92). 15 refs. [G.g.e.f.] P.O.

Fresh chips of Beech, Birch, Poplar (*Populus* × *marilandica*), Hornbeam and Oak, 0·2–0·5 × 10–30 × 5–8 mm., were sprayed with 5–7% NaOH solution, and the fibrous materials obtained after storage for 4–6 hr. at 20° or 2–3 hr. at 35–40° C. were tested for their chemical and paper-making properties (generally good). Results are tabulated. Hardboards of good quality were prepared on a laboratory scale from Beech chips by the same method. Chips of Birch and Beech agitated in a cold solution of $Ca(OH)_2$ gave fibres equal in properties to those obtained by the cold soda process.

2531. JAYME, G., and BRANSCHEID, F. Sulfitzellstoffe hoher Festigkeit aus *Eucalyptus saligna.* **[Strong sulphite pulps of *E. saligna.*]** *Papier, Darmstadt* 13 (13/14), 1959 (284–6). 6 refs. [G.g.e.f.] P.O.

Describes the relatively mild conditions used and gives data on pulp yield and properties. The pulp can be used for firm papers without the admixture of other long-fibred pulps.

2532. PEARL, I. A., and BEYER, D. L. **Separating lignosulfonates from carbohydrates in Aspen spent sulfite liquor by ion exchange.** *For. Prod. J.* 9 (10; 12), 1959 (381–3; 8*A*). 8 refs.

Complete separation was obtained in the laboratory by first decationizing the liquor (from the cooking of *Populus tremuloides*, *P. grandidentata* and *P. tacamahaca*) and then passing it over a regenerated column of Duolite A-2 anion-exchange resin (specially designed for the separation of these fractions in liquors from coniferous woods). [Cf. *F.A.* 18 Nos. 3324, 4577.]

2533. MACLEAN, A. A., and DOYLE, J. J. **Studies with waste sulphite liquor. I. Effects of waste sulphite liquor on crop yields and on soil properties. II. Waste sulphite liquor as a soil aggregating agent.** *Canad. J. Soil Sci.* 39 (2), 1959 (87–97). 13 refs. O.R.E.

(I) Significant increases in yields of oats and rye-grass resulted from the application of 2 tons of waste sulphite liquor solids (w.s.l.s.) per acre (supplying 120 lb. N/acre). W.s.l.s. increased the organic-matter content, cation exchange capacity, exchangeable H and the % of water-stable aggregates. (II) W.s.l.s. added to the soil and incubated for 7 weeks caused an increase in aggregation to a maximum at 3 weeks, followed by a decline and then by a second increase at 6 weeks.

862. Composite Materials made Wholly or Partly of Woody Matter

See also Nos. 1623, 2329, 2374, 2415, 2504, 2530.

2534. **Organization for European Economic Co-operation: Board mill survey. Economic study: United Kingdom by Sandwell & Co. Ltd., Vancouver, Canada.** H.M. Stationery Office, London. 1959. pp. 69. Price 5*s*.

The results of a study on the feasibility of establishing hardboard, chipboard, and insulating board mills in the United Kingdom based on the utilization of home-grown timber (forest thinnings). The report is on the same lines as that already published on small pulp mills [see *F.A.* 20 No. 5062].

2535. MORI, M. **[Studies on particle-board (I). On cutting of wood-flakes with a shaving machine.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 112, 1959 (115–24 + 4 plates). [Jap.e.*e.*]

A study was made to determine the effect of the angle at which the knife edge meets the grain, and the effect of cutting angle. In general best results were obtained when the angle of knife to direction of grain was as small as possible, and the highest yield of chips suitable for the manufacture of particle board when the cutting angle was 34·5°.

2536. Klauditz, W., Ulbricht, H. J., and Kratz, W. Über die Herstellung und Eigenschaften leichter Holzspanplatten. **[The production and properties of low-density chipboards.]** *Holz Roh- u. Werkstoff* 16 (12), 1958 (459–66). 15 refs. [G.g.e.] P.R.

Experimental boards from thin, flat chips of Spruce, Pine, Poplar and Beech, from Spruce sawdust, and from flax straw were made with a urea-formaldehyde resin content of ca. 6·9%, and in a density range of 0·3 to 0·5 g./c.c. The bending, tensile, and compression strengths, and swelling in water were determined. Results showed that boards of this density may be a practical proposition.

2537. Žogolev, A. L. Avtomatičeskie agregaty-smesiteli dlja proizvodstva drevesno-stružečnyh plit. **[Automatic mixing units for chipboard production.]** *Derev. Prom.* 8 (8), 1959 (10–2). [Russ.] P.R.

Description, with plans, of two newly designed mixers, one a vibrating, the other a drum type.

2538. Kontek, W. Strużka poekstrakcyjna z karpiny jako surowiec do produkcji płyt pilśniowych. **[Extracted chips from stumpwood, as a raw material for producing particle boards.]** *Sylwan* 103 (11), 1959 (67–72). 5 refs. [Pol.]

A brief general discussion of experience in Poland.

2539. Minin, A. N. O plitah iz drevesnyh othodov izgotovlennyh bez vjažuščih veščestv. **[Boards from wood waste, prepared without binders.]** *Derev. Prom.* 6 (2), 1957 (11–3). [Russ.russ.] P.R.

Graphs the relation of the strength (static bending), density, water absorption and swelling of boards made from sawdust and chips without binders, to the operation variables. Raw-material moisture contents of 5–20%, and press temperatures of 200–225° C. resulted in the best board properties. Strength and density increased with pressure from 20 to 100 kg./sq. cm., and with pressing time from 0·5 to 5 min. per mm. of finished board thickness. Water absorption and swelling decreased with increasing pressing time. Water absorption of boards pressed for ⩾ 3 min. per mm. of finished board thickness was less than that of solid Pine. Pressing schedules for three grades of board are presented, and also a plan of a factory for the production of particle boards without binders.

2540. Varaksin, F. D. Drevesnyj plastik bez svjazujuščih. **[Wood-based boards without binders.]** *Derev. Prom.* 8 (11), 1959 (7–10). [Russ.] P.R.

Gives a brief account of Russian work on making particle boards without binders, and shows graphically the effects of pressure, press temperature, and pressing time on the volume, density, water absorption, and strength (impact bending) of boards made from Birch sawdust. Mentions also the successful production of boards from raw materials treated with catalysts (including weak H_2SO_4 solutions) and pressed without binders at 40–50 kg./sq. cm. at 150–160° C.

2541. Kozel′cev, L. I. O smešivanii drevesnyh plit so svjazujuščim pri izgotovlenii plit. **[Mixing wood particles with binders in board manufacture.]** *Derev. Prom.* 8 (9), 1959 (12–4). [Russ.] P.R.

Discusses the influence of (*a*) mixing with atomized resins, and bulk mixing with (*b*) foamed, (*c*) unfoamed resins, on the quality of boards made from Pine and from Birch shavings and chips. In all four types of board, (*a*) gave the highest static bending strength and lowest water absorption; in general (*b*) was next best and (*c*) worst. The influence of resin concentration on board strength is graphed, and that of various resin additives on board strength and water absorption tabulated.

2542. Maxwell, J. W., *et al.* **A search for better particle board adhesives.** *For. Prod. J.* 9 (10), 1959 (42*A*–46*A*). 3 refs.

Describes accelerated ageing tests on boards, varying the composition and proportion of glue, size, shape and species of particle, manufacturing processes, etc. The commonly used urea-formaldehyde resin did not sufficiently withstand the combined effect of heat and moisture. Phenolic resins proved to be the most satisfactory, boards with a content of 7% resin solids retaining 50–70% of their original strength after ageing test. Softwood particles of low density were generally the most satisfactory. Stabilizing treatment of the chips either impaired or did not improve durability. Incorporation of 0·5% dieldrin (based on resin solids) in urea-formaldehyde and phenol-formaldehyde resins was very effective against termites and did not affect physical properties.

2543. Čerezova, V. M. Vlijanie parametrov pressovanija na stabil′nost′ plit iz drevesnyh častic. **[Influence of the pressing schedule on the [strength and dimensional] stability of particle boards.]** *Derev. Prom.* 8 (6), 1959 (16–8). [Russ.russ.] P.R.

Softwood chips of 4–5% m.c., which passed a 4-mm. but not a 2-mm. screen, were hot-pressed into boards, using a urea-formaldehyde resin, and the influence of press temperature, pressing time, specific pressure, and quantity of binder on board strength and dimensional stability was determined. Results are tabulated and graphed. It appeared that a temperature of 140° C., pressing times of ≯ 1 min. per mm. of thickness, and a pressure of 20–25 kg./sq. cm. gave optimum results. Increasing the proportion of resin binder from 4 to 24% [by wt.?] increased board strength and reduced its swelling in water, but > 20% resin was uneconomic.

2544. Ota, M., and Tsutsumi, J. **[Studies on the particle board produced from planer shavings. II. The influences of the curing cycle and the beginning time of the breathing period on the properties.]** *J. Jap. Wood Res. Soc.* 5 (3), 1959 (92–5). 3 refs. [Jap.e.*e*.] P.R.

[Cf. *F.A.* 20 No. 1222.] Studies the effect of curing cycles of 7, 10, 15 and 20 min., and a breathing period of 1 min. (at 3, 5 and 7 min. after initial pressing) on the physical and mechanical properties of particle boards [at constant resin content (4%), concentrated aqueous solution of resin (35%), and platen temperature (120° C.)]. From data (tabulated) on the moisture content, sp.gr., thickness, bending strength (b.s.), Brinell hardness (B.h.) and hygroscopicity of the specimens tested, and from the relationships (graphs given) between board properties and varied curing conditions, the following conclusions were drawn: (1) The b.s. is improved by delaying the start of the breathing period and is not affected by curing time. (The correlation coefficients between breathing time and b.s. are tabulated, and an equation for the regression formula derived.) (2) B.h. values taken in the breathing period 3 min. after the start of the curing cycle are lower than the rest. (3) Hygroscopicity is improved by a prolonged curing time and is unaffected by the starting time of the breathing period. (4) Board thickness is decreased by delaying the start of the breathing period and by prolonging the curing cycle from 7 to 10 min. For longer cycles the curves obtained are even. (5) A greater distribution of board thickness is obtained after 7 than after 10,15 and 20 min. curing cycles.

2545. DOSOUDIL, A. **Specifications for wood fibre boards: history of German specifications and comparisons with the specifications of other countries.** *Transl. Commonw. Sci. Industr. Res. Organ. Aust.* No. 4104, 1959. pp. 32 + 2 tbls., 2 gphs. 5 refs. Transl. by J. Hardy from *Holz Roh- u. Werkstoff* 15 (12), 1957 (500–11). [See *F.A.* 20 No. 2587.] Limited distribution.

2546. BENDER, F. **[Black] Spruce and Balsam [Fir] bark as a source of fibre products.** *Pulp Paper Mag. Can.* 60 (9), 1959 (*T*275–*T*278). 6 refs.

Reports details of laboratory experiments in which bark, as obtained from the drum barker of a pulp mill, was, after removal of slimey material, used for the production of hardboards and insulation boards. The boards so made met specifications for some classes of material.

2547. KUROKI, Y., HATANO, H., and KADITA, S. **[Studies on the fibreboard. VI. On the effect of resin sizing of the fibreboard.]** *Wood Res., Kyoto* No. 21, 1958 (61–72). 8 refs. [Jap.e.*e.*]

Describes tests using phenolic and melamine resins as sizing agents to improve the mechanical properties and water resistance of fibreboards made from White Lauan. Extensive tabulated data (in English) are given showing the relationship of mechanical strengths (m.s.) to pressing temperature, of m.s. to resin %, of water resistance (w.r.) to pH of test boards sized, of w.r. to pressing temperature, etc.

2548. PATTERSON, T. J., and SNODGRASS, J. D. **Effect of formation variables on properties of wood particle moldings.** *For. Prod. J.* 9 (10), 1959 (330–6). 13 refs.

Describes laboratory tests with varying (*a*) pressure (500–1500 lb./sq. in.), (*b*) resin content (5–15%), (*c*) moisture content (5–15%) and (*d*) fineness of particles (10–20 to 40 pan mesh [defined]) in making small dish-shaped mouldings from hammer-milled Douglas-Fir mill waste and phenol-formaldehyde resin. Increasing these variables, singly or in combinations, significantly increased bending strength, density, and hardness, and reduced water absorption, their effect being in descending order from (*a*) to (*d*). In many cases (*c*) rather than (*b*) could be increased to improve properties.

2549. SMITH, K. N. **Self heating of wood fiber.** *Tappi* 42 (10), 1959 (869–72). 8 refs. P.R.

Investigates the possibility of a thermal gradient existing in cubical samples of fibreboards made from 10 species of (I) hardwoods and northern softwoods, and (II) southern softwoods, in the U.S.A. A thermal gradient might exist because the outer part of the cube reached furnace temperature before the centre, or the outer part could conceivably self-heat and have a higher temperature than either the furnace or the centre of the sample. Results of tests in which samples were heated to 325° F. in a specially constructed furnace showed that: (1) self-heating (s.h.) of the fibreboard occurs, and is apparently due to an exothermic reaction (e.r.) of some component that is extractable with a 2/1 pure-benzene/denatured-ethanol solution; (2) the rate of s.h. is apparently controlled by the amount of such extractable material in the wood fibre; (3) the rate of the e.r. is affected by fibre size; (4) the wood component responsible for the e.r. is relatively non-volatile at either high temperature or low pressure; (5) the fibres of (I) differ from those of (II) in s.h. properties; (6) the presence of moisture does not accelerate the e.r. but rather extends the time required for reaching ignition temperature. Tabulated data showing the extractable content (%) and the reaction rate (°F./min.) of various wood fibres, and a graph indicating the effect of extractable content on reaction rate, for (I) and (II), are given.

863. Wood Hydrolysis. Saccharification

See Nos. 2336–7.

864. Utilization of Lignin

See Nos. 1907, 2533.

865. Plastics

2550. BORGIN, K. **The moulding of wood particles.** *Timb. Technol.* 67 (2246), 1959 (482–6). 5 refs.

[Cf. *F.A.* 16 No. 1205.] In order to investigate the possibilities of manufacturing products other than flat boards and sheets from wood particles, an experimental moulding press was used with different moulds to press South-African-grown *Pinus radiata* sawdust (with synthetic resins) into various shapes. The best moulding temperature was 110° C., and time 10 min. The following were determined: effects of moulding pressure and resin content on density; the relation of density to mechanical strength; and the amounts of water absorption, swelling, and strength reduction after immersion in water. Results are tabulated and graphed. The South African sawdust particles are larger and more splinter-like than the usual European sawdust, which accounts to a certain extent for the relatively high strength of the mouldings. The strengths of wood and wood-particle mouldings are compared, and imperfections in bonding and the particle mouldings' lower resistance to water discussed. Much more research needs to be done, but the wood-particle moulding industry is thought to have great potentialities.

866. Utilization of Wood Extractives

See Nos. 2336, 2538.

867. Destructive Distillation

See also No. 1849.

2551. WARD, J. C. **Air seasoning of wood reduces charcoal production time.** *Tech. Note Lake St. For. Exp. Sta.* No. 566, 1959. pp. 2. 1 ref.

Average carbonization time for air-seasoned *Acer saccharum* (mean m.c. ca. 35%) was 12 hr., compared with 20 for green (m.c. ca. 62%). Average charcoal yields, in % of oven-dry weight of kiln charges, were 29·3 and 26·4 respectively.

2552. SATONAKA, S. **[Wood carbonization temperature and the products (continued).]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (1), 1959 (257–77). 27 refs. [Jap.jap.e.*e*.]

In the studies reported earlier [see *F.A.* 16 No. 1222] oven-dry test pieces of *Quercus crispula* were carbonized in an electric furnace at temperatures up to 1100° C. by 100° intervals. In the present report, adsorption of water vapour, calorific value, reactivity tested by the wet oxidation method, and crystalline structure, of these charcoals are described.

2553. KISHIMOTO, S., *et al.* **[Studies on charcoal making (Report 4). Effect of chemicals upon the increase of charcoal yield.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 115, 1959. pp. 64. 19 refs. [Jap.e.*e*.]

Studies were made to determine the effect of certain inorganic chemicals on yield of charcoal, properties of smoke etc. Chemical fertilizers are suitable for this purpose. In an experiment, sawdust was soaked in solutions of $(NH_4)_2SO_4$, NH_4Cl, urea, or KCl, then dried, and carbonized. Yields of charcoal were almost twice as much as with ordinary methods. Use of $(NH_4)_2SO_4$ or urea imparted some odour to the charcoal, and SO_2 was given off by charcoal made with $(NH_4)_2SO_4$. NH_4Cl, however, gave little trouble, and charcoal prepared with it was almost equal in quality to that obtained by normal methods. Brushing wood with a 28% solution of NH_4Cl increased yield by 20%, but imparted an odour to the charcoal. A third method, very easy to carry out, increasing yields by 15–30% and producing charcoal of excellent hardness and density, is based on the fact that NH_4Cl sublimates at 339° C., and that kiln temperature rises in the upper part at first, carbonization beginning near the ceiling and proceeding gradually downwards. If a small amount of NH_4Cl is scattered on the upper layer of wood when the kiln is charged, it sublimates with the progress of carbonization, adheres to the uncarbonized, cooler wood and diffuses to all the wood in the kiln. In the final stages of carbonization NH_4Cl gas is detected in the exhaust smoke, and therefore refining must be started earlier and the draught outlet made about twice as large as usual.

2554. HANZAWA, M., and SATONAKA, S. **Carbonization of wood by dehydrating agent. Part IV. On the properties of the hydrated active charcoal (H-A charcoal).** *Res. Bull. Exp. For. Hokkaido Univ.* 19 (1), 1958 (253–61). 2 refs. [E.e.jap.]

H-A charcoal from wood contained 63% C, 2·5% H, 0·5–1·1% S, and 0·2–0·6% ash, i.e. H-A charcoal had a lower degree of carbonization than ordinary wood charcoal. It had, however, a comparatively high sp.gr. (ca. 1·6). [Cf. *F.A.* 19 No. 2514.]

89. Other ('Minor') Forest Products

892. Vegetable Products

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 1411–2, 1416, 1829, 2546.

2555. SOKOLOV, P. D. O tannidonosnosti nekotoryh rastenij Talyša. **[The tannin contents of some plants of the Talysh region [S. Azerbaijan].]** *Bot. Ž.* 44 (9), 1959 (1328–33). 18 refs. [Russ.]

The tannin content of various organs of *Quercus castaneifolia, Parrotia persica, Alnus barbata, Carpinus caucasica, Acer velutinum, Albizzia julibrissin, Tamarix ramosissima* and several herbaceous plants was determined (results tabulated). Of the trees, the stem bark of *P. persica* had the highest content (10·14% oven-dry weight), and leaves of *Q. castaneifolia* the next highest (6·21%). *A. velutinum* (leaves and bark) and *A. julibrissin* (leaves and stem bark) contained no tannin.

2556. LAMA GUTIÉRREZ, G. DE LA, and GAVIÑA MÚGICA, M. Sección de destilación de leñas y combustibles vegetales. Curtientes y taninos. **[Section for dry distillation of firewood and for vegetable fuels. Tanstuffs.]** *An. Inst. For. Invest. Exp. Madrid* 30 (3), 1958 (155–63). [Span.]

Presents the results of extractions by both hot and cold water of bark and sawdust of *Eucalyptus globulus, E. rostrata* and stems of *Calluna vulgaris* to investigate their tanstuff content.

2557. SAKATA, K., KISHIMOTO, J., and SAEKI, H. **[On the bark tannin and wood properties of Wattle trees grown in Tottori City.]** *Res. Bull. Exp. For. Hokkaido Univ.* 20 (1), 1959 (119–37). 13 refs. [Jap.jap.e.*e*.]

The material of the study was derived from 6-year-old trees of *Acacia decurrens* var. *mollissima* and *A. dealbata*, killed by a severe frost (−4·1° C.). Factors investigated were mean height and d.b.h., thickness and air-dry weight of bark, tannin content of bark, and physical and mechanical properties of the wood.

2558. WILLIAMS, L. O., and ERLANSON, C. O. **Brazilian cork.** *Qualit. Plant. Mater. Veg.* 6 (2), 1959 (114–20). 5 refs. [E.span.] E.M.B.

Notable among the trees of the *campos cerrados* having a thick, corky bark is Pau Santo (*Kielmeyera* *coriacea*), which was exploited during World War II as a source of cork. Notes are presented on the tree and its ecology. Tests by an American Company have shown Pau Santo cork to be a poor substitute for Mediterranean cork.

2559. Corbett, R. E., and McCraw, E. H. **Extractives from the New Zealand Myrtaceae. IV. Triterpene acids from the bark of *Leptospermum ericoides*.** *J. Sci. Food Agric.* 10 (1), 1959 (29–31). 5 refs. P.O.

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants, etc.

See also Nos. 1842, 2297.

2560. Oliver, B. **Nigeria's useful plants. Part II. Medicinal plants (4).** *Nigerian Field* 24 (4), 1959 (160–82).

[Cf. *F.A.* 20 No. 3953.] Covers *Piper* to *Zizyphus.*

2561. Simes, J. J. H., *et al.* **An Australian phytochemical survey. III. Saponins in eastern Australian flowering plants [mainly those from the rain-forest area].** *Bull. Commonw. Sci. Industr. Res. Organ. Aust.* No. 281, 1959. pp. 31. 31 refs.

[Cf. *F.A.* 14 No. 3982.] Results of spot tests and confirmatory laboratory extractions of 1136 species, including many trees, from 45 families, are tabulated. Families especially rich in species containing saponins are Ebenaceae, Leguminosae, Myrtaceae, Pittosporaceae, and Sapindaceae.

2562. Pachter, I. J., Zacharias, D. E., and Ribeiro, O. **Indole alkaloids of *Acer saccharinum* (the Silver Maple), *Dictyolama incanescens*, *Piptadenia colubrina* and *Mimosa hostilis*.** *J. organ. Chem.* 24 (9), 1959 (1285–7). 11 refs. O.R.S.

Gramine was isolated from leaves of *A. saccharinum*, *N*, *N*-dimethyl-5-methoxytryptamine from bark of *D. incanescens*, bufotenine from seeds of *P. colubrina*, and *N*, *N*-dimethyltryptamine from roots of *M. hostilis.*

2563. Pachter, I. J. **A note on the occurrence of gramine in *Acer rubrum* L.** *J. Amer. Pharm. Ass. (sci. Ed.)* 48 (11), 1959 (670). 1 ref. O.R.S.

Leaves and stems of *A. rubrum* showed traces of alkaloids, and the winged fruits larger amounts. A crystalline alkaloid isolated from dried ground fruit proved to be identical with synthetic gramine.

2564. Hove, L. van. Contribution à l'étude des alcaloïdes de l'*Holarrhena congolensis* Stapf. Structure de l'holarrhenine. **[The alkaloids of *H. congolensis*. The structure of holarrhenin.]** *Tetrahedron, Lond.* 7 (1/2), 1959 (104–17 + 1 gph.). 26 refs. [F.f.e.] O.R.S.

2565. Price, J. R. **Alkaloids of the Australian Rutaceae: *Lunasia quercifolia*. II. The nature of lunasine.** *Aust. J. Chem.* 12 (3), 1959 (458–67). 19 refs. O.R.S. [Cf. *F.A.* 21 No. 1215.]

2566. Paris, R., and Letouzy, R. Variations de teneur en alcaloïdes des écorces de *Pausinystalia yohimbe* (K. Schum.) ex Pierre (Rubiacées). **[Variations in the alkaloid content of the bark of *P. yohimbe* (Rubiaceae).]** *J. Agric. trop. Bot. appl.* 4 (1/2), 1957 (31–3). [F.] A.P.B.

Alkaloid content increased from the ground upwards to the first branches and then decreased again. It was slightly greater on the N. side of trees than on the S.

2567. Sarkar, B., and Khanna, N. M. **Chemical examination of [the stems of] *Grewia populea*.** *J. sci. industr. Res. India* 18 *C* (1), 1959 (20). P.O.

2568. Mukerjea, T. D., and Govind, R. **Studies on indigenous insecticidal plants: part II. *Annona squamosa*.** *J. sci. industr. Res. India* 17 *C* (1), 1958 (9–15). 14 refs. P.O.

Compares the insecticidal properties of the ether extract of the seeds with those of DDT and pyrethrins. DDT was considerably more effective against *Musca nebulo*, *Tribolium castaneum* and *Bombyx mori*. An insoluble resin obtained by treating the extract with petroleum ether was 6 times as toxic as the ether extract.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also Nos. 1416, 1823, 2353.

2569. Costa, A. Fernandes, and Vale, J. Cardoso do. **Materials for the study of aromatic Portuguese plants. Volatile oil of *Juniperus phoenicea*.** *Boletim da Escola de Farmácia, Universidade de Coimbra* No. 13/14, 1953/1954 (1958), (57–67). [Port?] From *abstr.* in *Chem. Abstr.* 53 (6), 1959 (5419). P.R.

Fractionation of oil obtained from trees growing wild in Portugal showed the preponderance of terpene hydrocarbons (ca. 94%), of which α-pinene formed 78% of the oil; nopinene, limonene and β-phellandrene occur in smaller amounts, and furfural was detected by its colour reaction with aniline. The tail fractions from distillation (6–8%) included alcohols, esters, etc.

2570. Bowyer, C., and Jefferies, P. R. **Studies in plant chemistry. I. The essential oils of *Eucalyptus caesia* Benth. and *E. torquata* Luehm. and the structure of torquatone.** *Aust. J. Chem.* 12 (3), 1959 (442–6). 3 refs. O.R.S.

A preliminary study of the essential oils showed the presence of a common ketonic substance, $C_{16}H_{24}O_4$, for which the name torquatone is proposed. Its structure was determined.

2571. Corbett, R. E., and Gibson, M. G. C. **Extractives from the New Zealand Myrtaceae. V. The volatile oil from *Leptospermum ericoides*.** *J. Sci. Food Agric.* 10 (3), 1959 (198–200). 8 refs. P.O.

2572. Dhar, P. K., and Mukherjee, S. **Structure of the Jeol (*Odina wodier*) gum: nature of sugars and aldobiuronic acid in Jeol gum.** *J. sci. industr. Res. India* 18 *B* (5), 1959 (219–20). 10 refs. P.O.

892.7. Fruits. Seeds. Fibres, Yarns and Flosses

See Nos. 1504, 1822.

892.8. Heather. Broom etc. Osiers. Canes and Bamboos. Reeds and Rushes. Thatching Materials

See Nos. 1624, 1656, 2451.

893. Animal Products

See also No. 1832.

2573. Krafft, A. Avkastning av jakt og fangst i Hurdalssjøområdet. **[Yields from shooting and trapping in the Hurdal Lake district.]** *Tidsskr. Skogbr.* 67 (3), 1959 (143–6). [Nor.]

Presents tabulated figures showing the mean numbers of each of 19 species of animal and bird (including those killed for meat and for fur, and others) killed per 100 sq. km. in 1953–55, and compares the figures with some from elsewhere in Norway. Concludes that the yields of meat from game birds, hares, roe deer and elk amounted to 2–3 tons/100 sq. km. of forest land.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. General

902. History of Forests and Forestry

See also Nos. 1573, 1576, 1670.

2574. **First centenary of forest administration in Madras State. Souvenir 1856–1956.** Forest Department, Madras. 1959. pp. 33 + 66 + 61 + 7 photos + 1 map.

In three parts: (I) Messages and communications from former forest officers and administrators; (II) Articles on general forestry and forest development; (III) Descriptive account of the forests of Madras State.

2575. Smith, J. S. **Past, present, future—a review.** *Extr.* from *Rep. For. Adm. Malaya 1958*, 1959 (34–43 + 8 photos).

Reviews the work of the Forest Department since its foundation in 1901.

903. Forest Policy, General

See also No. 2589.

2576. Forst- und Holzwirtschaftspolitik im Wandel der Gesetzgebung. **[Forest policy and the policy regarding wood industries as reflected in legislation.]** *Holz-Zbl.* 85 (150), 1959 (2021–3). 5 refs. [G.]

Briefly comments on the three periods distinguished: (1) the Nazi period, introducing a planned economy (1934–45); (2) the transition period from the surrender to the currency reform (1945–48); and (3) the restoration of a free market economy (1948–53) in W. Germany, and lists 67 laws and ordinances (W. German or occupation forces since 1945) carrying these policies into effect in the sector of the economy concerned with forests and wood.

904. General Regional Accounts of Forests and Forestry

See also Nos. 1649, 1676, 2574.

2577. Parkin, K. F. **Forestry in Northern Ireland.** *Quart. J. For.* 53 (4), 1959 (297–307).

A description of the work being carried out by the Forestry Division of the Ministry of Agriculture, N. Ireland.

2578. **Forestry Commission Guide. Cambrian forests.** H.M. Stationery Office, London. 1959. pp. 103. Many refs.

Includes articles on historic, botanical, zoological, and geological aspects of forestry in North and mid-Wales, notably on the policy and achievements of the Forestry Commission (*W. L. Cadman*), plant life in natural and old-established woodlands (*L. Newton*), and forest fauna (*W. Condry*).

2579. Matzek, R. Die Forst- und Holzwirtschaft der Saar. **[Forestry and wood industries in the Saar.]** *Holz-Zbl.* 85 (137), 1959 (1845–9). [G.]

A general description of the forests, their distribution, constitution, composition, administration, yield, etc., and the needs and products of sawmills and other industries. So far, the transfer of the area to Germany has not led to serious economic repercussions.

2580. Rubner, H. Die polnische Forst- und Holzwirtschaft in Masuren und Ermland. **[Polish forestry and wood industries in Mazuria, including the former Ermeland.]** *Forst- u. Holzw.* 14 (23), 1959 (495–7, 498). 6 refs. [G.]

Covers forest area, reforestation, ownership, administration, species, fellings, the wood industry, and the importance of the region to the Polish forest economy.

2581. Paramonov, A. **The forests of Azerbaidzhan and Georgia.** *Caucasian Review, München* No. 8, 1959 (27–33). 24 refs. [E.]

[Cf. *F.A.* 19 No. 3666.] Using data from (mainly) Soviet sources, gives details of the extent and type of forests in the two republics, plans for afforestation, and the inter-relation of forests with hydro-electric and irrigation operations. The author develops the thesis, based on Forestry Department reports for 1906 and subsequent years (before 1917), that, contrary to Soviet opinion, over-exploitation is a main feature of post- rather than pre-1917 management.

2582. Benson, J. L. **A visit to Denmark.** *Quart. J. For.* 53 (4), 1959 (308–17).

Reviews briefly Danish forestry, on the basis of visits to State and private forests near Copenhagen, particularly the general principles and objects of management, current market trends, silviculture, etc.

2583. Huneke. Forst- und Holzwirtschaft im Heiligen Land (Teil Israel). **[Forestry and the wood**

industry in the Holy Land (Israel).] *Forst- u. Holzw.* 14 (23), 1959 (498–501). [G.]

Covers forest area, establishment and choice of species, afforestation in the steppe and desert area of the Negev, street trees, shelterbelts, organization and research, labour, forest products and the wood industry.

2584. LE DJUI TRIN. V′etnamskie lesa i voprosy lesnogo hozjajstva Severnogo V′etnama. **[The forests of Vietnam, and problems of forest management in N. Vietnam.]** *Lesn. Hoz.* 11 (11), 1958 (89–92). [Russ.]

Discusses briefly the forested area, climate, stocking, wild life, and forest types of the Democratic Republic of Vietnam. Recent history of the forests during the period of French administration, the civil war, and after the establishment of the Republic is outlined. Increases in output of forest products, the introduction of afforestation schemes, mechanization, and forest education at Hanoi Agricultural Institute are discussed, and the importance of Sino-Russian aid, both practical and educational, is emphasized.

2585. GENNBURG, O. Die forstwirtschaftliche Entwicklung Marokkos. **[The development of forestry in Morocco.]** *Forst- u. Holzw.* 14 (22), 1959 (475–9). [G.]

Discusses climate and geography; the species in the natural forests, and in plantations (69·8% *Eucalyptus* spp.); tabulates yields of the different forest products from 1952 to 1957 for Spanish and French Morocco; and gives an account of afforestation to date, with data on areas planted, plans, species, etc.

2586. HAYES, G. L. **Forest and forest-land problems of Southern Oregon.** Pacific Northwest Forest and Range Experiment Station, Portland, Ore. 1959. pp. [iv] + 54. 11 refs.

A general description of the province, its resources (of which timber and water are the most important) and development, with a discussion of the most urgent forestry research problems. In the context of species deserving special attention, some data on the superior growth and soundness of Sugar Pine as compared with Douglas Fir are given.

905. Forest Statistics and Resources

See also Nos. 2260, 2429.

2587. S″EDIN, G. Lesnaja promyšlennost′ Kitaja na pod″eme. **[The increase in China's forest industries.]** *Lesn. Prom.* 1959 (10), (30–2). [Russ.]

Tabulates data from the Chinese Ministry of Forestry on (*a*) forest area (total nearly 70 million ha.), % forest cover (average 10·1%), and standing volume (6540 million cu. m.), for each province (including Formosa and Tibet), and (*b*) national annual volumes felled (5·92 million rising to 26 million cu. m.) and sawtimber yields (2·72 million rising to 4·04 million cu. m.), from 1950 (the year the Ministry of Forestry was created) to 1957. The organization of the Chinese Forest Service from the Ministry downwards is loosely described. Targets listed for 1962 include: 24–30 million cu. m. sawtimber, 700,000 cu. m. plywood; 1–1·2 million tons fibreboard; 1·6–2 million cu. m. chipboard.

2588. VASILYEV [VASIL′EV], P. V. **Prospects for industrial consumption of wood and for development of forest economy in USSR under seven-year plan, 1959–1965.** *J. For.* 57 (11), 1959 (818–21).

An account (by the Deputy Director of the Forest Institute of the U.S.S.R. Academy of Sciences), discussing the 1965 targets in the forest products industry (figures for 1958 in parenthesis): total wood harvest 327–334 million cu. m. (276·7 million); plywood production 1,632,000 cu. m. (802,500); paper 2,874,000 tons (1,743,000); particle board 2,955,000 cu. m. (21,800); fibreboard 277 million sq. m. (32·7 million). Also discusses instances of integrated utilization, intensified management, and research.

2589. PONOMAREV, A. D., GORJAČEV, I. V., and GROŠEV, B. I. O rasčetnoj lesoseke v lesah II gruppy na 1961–1965 gg. **[The estimated cutting area in Group-II forests for 1961–65.]** *Lesn. Hoz.* 11 (11), 1958 (4–10). [Russ.]

The Group-II forests of the U.S.S.R. [mostly in sparsely wooded regions; not classed as protection forests; small-scale clear fellings permitted as long as they do not exceed the increment] are situated largely in regions with good transport facilities and an adequate labour force. In many areas, mainly in the centre, south, and west of European Russia, serious overcutting has continued; in others, e.g. the Far East, undercutting has been the rule. The authors tabulate and discuss figures from the 1961–65 five-year plan, envisaging adjustments in the various regions. These would result in a small net reduction (ca. 1%) in the total felling area for such forests as compared with the figure for 1956.

907. Indirect Significance of Forests (Rural Amenity, National Parks, Forest Influences, etc.)

See also section 116.

2590. HUNZIKER, T. Landschaftsschutz und Nationalstrassenbau: zur Mitarbeit des Forstdienstes, vor allem bei der Bepflanzung. **[Landscape planning and the building of national highways [in Switzerland]. The cooperation of the forest service, particularly in planting.]** *Schweiz. Z. Forstw.* 110 (10/11), 1959 (702–12). 8 refs. [G.]

Discusses chiefly the objects and guilding principles in roadside planting formulated by the Association of Swiss Road Experts [*Vereinigung schweizerischer Strassenfachleute*] including aid to traffic, protection of roadworks and neighbouring properties, conservation of rural amenities, and (secondarily) wood production. The collaboration of foresters is considered desirable at the planning level to ensure correct evaluation of sites, due consideration of ecological aspects, preservation of essential vegetation, choice of species, adequate spacing, etc. In general, the use of native species that blend into the landscape is advocated.

2591. Parques nacionales argentinos. **[National parks of Argentina.]** Dirección General de Parques Nacionales, Secretaria de Estado de Agricultura y Ganadería de la Nación, Buenos Aires. 1959. pp. [48]. [Span.]

Brief notes on the most important characteristics of Argentina's 10 national parks, and of the petrified forest at Santa Cruz.

91. Land Use, Land-Use Policy (including Afforestation Policy)

See also Nos. 1391, 1800, 2262.

2592. MACDONALD, J. A. B. **Integration of forestry and the hill sheep farm.** *Quart. J. For.* 53 (4), 1959 (317–22).

The disappearance of scrub woodland on many of the hills in Scotland and N. England is due more to grazing than to active clearing. Rapid deterioration of the soil has resulted. The integration of forestry and sheep farming holds great possibilities for reviving soil fertility in hill sheep-farming areas, as well as increasing shelter, production and the rural populations. Four instances of integration are discussed.

2593. BOURQUI, P., and WEID, F. VON DER. L'aménagement sylvo-pastoral des Préalpes fribourgeoises. **[The management of the pre-Alps in Canton Fribourg in the interests of forestry and pasture husbandry.]** *Alpwirtschaftliche Monatsblätter, Bern* 92 (6), 1958 (207–10). [F.] A.P.B.

Briefly comments on the directives of 1958 for the delimitation of forest and pasture issued jointly by the cantonal departments of forestry and of agriculture as a guide to voluntary consolidation schemes, reproduced in French and also in German (on pp. 204–6). These discuss principles, technical and administrative problems, and cantonal or federal grants available for afforestation, pasture improvement, road-building etc. in the furtherance of schemes for increasing the productivity of these hill areas. [Cf. *F.A.* 19 No. 2581.]

2594. **FAO Mediterranean Development Project. The integrated development of Mediterranean agriculture and forestry in relation to economic growth. A study and proposals for action.** FAO, Rome. 1959. pp. xix + 213 + 3 maps.

Comprises (*A*) a general report, and (*B*) country studies on Iraq, Syria, Lebanon, Tunisia, Morocco, Spain, Jugoslavia, Greece, Israel and Turkey. The report covers physical characteristics of the region, population, economic development, land use, programmes for the improvement and integration of agriculture and forestry, and problems connected with their execution.

2595. COOPER, C. F. **Multiple land use on the Salt River watershed, Arizona.** *J. For.* 57 (10), 1959 (729–34). 13 refs.

Describes the topography, climate, vegetation, population and land ownership, and discusses the relative importance of the four major land uses. It is concluded that these are, in descending order of importance, water production, recreation, timber production, and livestock grazing. Future developments (mainly maximum efficiency in multiple land use) are discussed.

2596. PHILLIPS, J. **Agriculture and ecology in Africa: a study of actual and potential development south of the Sahara.** Faber and Faber, London. 1959. pp. 423 + 1 map. 16 pp. of refs. Price £3. 3*s*.

The work is divided into five sections: (1) Scope, basis of approach and the background to the problems of agricultural and related development; (2) The forest bioclimatic region and its challenge and promise in regard to agricultural and related developments (including an outline of the general setting and nature of the forest region and its major ecological divisions, sub-regions and units); (3) The great wooded savanna and related bioclimatic regions and their challenge to and promise for agricultural and related development; (4) Problems of human and animal health and of economics and planning in agricultural and related development; and (5) General conclusions and suggestions.

2597. **Finland: legislation on land use.** In *FAO Food agric. Leg.* 8 (1), 1959. pp. 33.

2598. **Iraq: Agrarian Reform Law No. 30.** In *FAO Food agric. Leg.* 8 (1), 1959. pp. 18.

2599. **Pakistan: West Pakistan land reform regulation.** In *FAO Food agric. Leg.* 8 (1), 1959. pp. 17.

92. Forest Ownership and Ownership Policy

See also Nos. 2231, 2234–9, 2593.

2600. DECENCIÈRE-FERRANDIÈRE, H. Forêts appartenant aux Caisses d'Épargne. **[Forests belonging to Savings Banks.]** *Rev. for. franç.* 11 (12), 1959 (869–71). [F.]

Savings Banks in France are permitted, by a law of 2 July 1913, to acquire and own forests. The regulations involved, and the recent increase in such forests are discussed.

93. Public Supervision and Regulation of Forestry, including Legislation for these Purposes

See also Nos. 1815, 2252, 2576, 2597–9, 2606–8.

2601. PALKOVICS, G. Das Überhangsrecht in der Forstwirtschaft. **[Nuisance by over-hanging branches [and encroaching roots] in relation to forestry.]** *Allg. Forstztg.* 70 (21/22), 1959 (243–5). 8 refs. [G.]

Outlines the legal position in Germany, Switzerland and more especially Austria, where it is far from clear but where it has been held that the general right to remove branches and roots above and below one's land does not apply to forest trees if it runs counter to regulations framed to promote sound forestry, and discusses in this context provincial regulations limiting tree planting near the borders of agricultural land and the provisions of the Austrian draft forest law.

94. Other Methods to Implement Forest Policy

See also Nos. 1801, 2593.

945.2. Publicity, Propaganda (including Demonstration Forests)

2602. DAWKINS, H. C. **Information on the Mpanga research forest.** *Tech. Note For. Dep. Uganda* No. 77, 1959. pp. 4.

Covers its ecology, tree species (classified into the groups: obligate light-demanders, shade-bearers, and obligate shade-demanders), ridge sites and swamps, recommended survey methods, and permanent sample-plot studies on growth rate and on methods of increasing yield by variations in the felling system, chemical control of weed trees, etc.

945.3. Education. Training. (Including Educational Tours and Information on Careers)

2603. WINKELMANN, H. G. **Report to the Government of India on the logging training centre at Batote.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1087, 1959. pp. 26 + 17 photos.

[Cf. *F.A.* 21 No. 1288.] The final report on the courses. The recommendations based thereon are contained in the interim reports.

2604. SASSE, O. Die Waldarbeiterausbildung in Schweden. **[The training of forest workers in Sweden.]** *Holz-Zbl.* 85 (111), 1959 (1481–3). [G.]

Describes recent development in the teaching of forestry subjects in ordinary schools, the training of forest farmers through special courses held, mostly at residential schools, by the State-forest and crown-forest administrations. Duration, syllabus, practical and theoretical instruction, training of teachers etc. are discussed. [Cf. *F.A.* 13 No. 3534.]

2605. DEVALL, W. B. **Professionalism and foresters' licensing.** *J. For.* 57 (10), 1959 (720–3). 1 ref.

It is thought that registration and licensing of foresters bring increased public recognition of their professional status, and add prestige to the profession. Experience in Alabama, which began licensing in 1957, is discussed.

945.4. Research

See also Nos. 1308, 1466, 1932, 2586, 2602.

2606. Memoria 1957. **[Report for 1957.]** *Mem. Com. Nac. Eucalipto, Madrid* 1957. pp. 92. 6 pp. of refs. [Span.]

The report consists of two parts: (1) Work of the Spanish National *Eucalyptus* Commission, including five-year plans of work and research and a review of the present situation and future possibilities in 10 provinces, and (2) Spanish legislation governing the cultivation and exploitation of Eucalypts, and a list of Spanish publications up to the time of the report.

2607. Memoria 1957. **[Report for 1957.]** *Mem. Com. Nac. Corcho, Madrid* 1957. pp. 81 + 2 sets of gphs., 1 map. 5 pp. of refs. [Span.]

The report is in three parts: (1) a summary of the work of the Spanish National Cork Commission in 1957, with the following appendices, (*a*) programme of research on the influence of stock on natural regeneration, and (*b*) reports presented by the Cork Oak Working Party of the Joint Subcommission on Mediterranean forest problems; (2) a list of legislative ordinances affecting directly or indirectly, the cork industry; and (3) a list of Spanish publications up to the date of the report.

2608. Memoria 1957. **[Report for 1957.]** *Mem. Com. Nac. Chopo, Madrid* 1957. pp. 122. 4 pp. of refs. [Span.]

A report in four parts: (1) Work of the Spanish National Poplar Commission in 1957, including 5-year plans of work and research, and a review of the present situation and possibilities for expansion in 8 provinces, (2) projected work for 1958, (3) Spanish legislation governing the cultivation and exploitation of Poplars, and (4) a list of Spanish publications on Poplar up to the time of the report.

2609. El Instituto Forestal de Investigaciones y Experiencias. **[The [Spanish] Forest Research Institute.]** Caza y Pesca Fluvial, Dirección General de Montes, Ministerio de Agricultura, Madrid. [*n.d.*] pp. [23]. [Span.]

A mimeographed booklet presenting information on the Madrid Institute, its organization and functions.

2610. **Research programme [for Malaya] 1958–1962. (Including a summary of work accomplished in years 1953–1957 and a progress report for 1958.)** *Res. Pamphl. For. Res. Inst., Kepong* No. 26 1959. pp. 224.

2611. **Department of forest research, officers' conference, Ibadan 1957.** Federal Government Printer, Lagos. 1958. pp. 59. Price 9*d.*

Contains the following papers *inter alia*: T.S.S. [Tropical Shelterwood System] investigations (*H. Davies*); Field measurements and techniques (*M. E. Dommen*) [notes on simple methods of mensuration in current use]; An investigation into tree poisoning and a comparison of the effects of contact arboricides and sodium arsenite (*H. Davies*); Notes on contact arboricides and sprayers (*H. Davies*); Nursery technique (*C. A. M. Nash*); Swamp forests of the Eastern Region: their characteristics, growth and management (*L. G. Cooper*); Re-establishment of forest conditions in savanna country: natural succession following fire protection (*R. W. J. Keay*); Re-establishment of forest conditions in savanna country: plantations (*C. A. M. Nash*); *Eucalyptus* in the Northern Region (*C. A. M. Nash*); *Eucalyptus* in the Eastern Region (*L. C. Cooper*).

2612. **Forest research review: year ended March 1959.** British Columbia Forest Service, Victoria, B.C. 1959. pp. 63.

946.1. Associations. Societies

See No. 1465.

946.2. Conferences and Excursions

See Nos. 2263, 2611, 2614.

95. Forest Taxation

2613. HART, C. E. **Taxation of woodlands in England and Wales (up to and including the Finance Act of 1959).** The Author, Coleford, Glos. 5th ed., 1959. pp. 12. Price 3*s.* [Cf. *F.A.* 13 No. 4480.]

2614. **Taxation and conservation of privately owned timber. Proceedings of a conference held at**

the University of Oregon, January 27, 28, 1959. Bureau of Business Research, University of Oregon, Eugene, Ore. 1959. pp. iv + 95. Price $ 2.00.

Includes the following papers, with discussion: Social objectives of conservation of natural resources with particular reference to taxation of forests (*S. V. Ciriacy-Wantrup*); Taxation as a tool for accomplishing social objectives in forest management (*A. D. Scott*); Inheritance taxes (*M. R. Benedict*); Forest yield and severance taxes (*R. Campbell*); The property tax on forest land and timber (*E. T. Williams*); The impact of capital gains taxes on timber resource utilization (*W. J. Mead*).

96. Forest Labour Questions; Labour Questions in Wood Transport and the Wood Industries

See also No. 2232.

2615. Steinlin, H. Waldarbeitermangel in der Forstwirtschaft und Möglichkeiten seiner Abhilfe. **[Labour shortage in forestry and the means to overcome it.]** *Allg. Forstzeitschr.* 14 (43), 1959 (753–6). 2 refs. [G.g.]

Though shortages in Germany are local rather than general, they are likely to increase owing to the age structure of the labour force, changes in agricultural conditions, etc. Means of making forest work attractive (security, earnings, housing, etc.) and of raising its productivity are discussed, the latter including the compromise solution of concentrating work (felling, planting, thinning etc.) in larger areas to aid mechanization and cut out excess unproductive time. [Cf. *F.A.* 20 No. 5052.]

97. International Forest Policy and Other International Collaboration

971. Congresses, Conferences

See also Nos. 1353–4, 2230, 2262.

2616. **Papers, International Union of Forest Research Organizations, 12th Congress, Oxford 1956. Vol. IV.** Forestry Commission, London. 1958. pp. 308.

Papers read in Sections 31 (Forest Economics), 32 (Operational Efficiency), and 41 (Properties of Forest Products), for the most part noticed separately in *F.A.* 18. [Cf. *F.A.* 21 No. 1306.]

FORESTRY THE WORLD OVER

References: 1. *American Forests*, Washington; 2. *Connecticut Woodlands*, Wallingford, Conn.; 3. *Daily Telegraph*, London; 4. *FAO Press Release*, Rome; 5. *Forestry Newsletter for the Near East*, Cairo; 6. *Forest Products Journal*, Madison, Wis.; 7. *Forest Products Newsletter C.S.I.R.O.*, Melbourne; 8. *Forests & People*, Alexandria, La.; 9. *Holz-Kurier*, Vienna; 10. *Holz-Zentralblatt*, Stuttgart; 11. *India News*, London; 12. *Internationaler Holzmarkt*, Vienna; 13. *I.U.C.N. Bulletin*, Brussels; 14. *Journal of Forestry*, Washington; 15. *Journal of Soil & Water Conservation*, Des Moines, Iowa; 16. *Leaflet of the Ministère d'Agriculture*, Paris; 17. *Nature*, London; 18. *New Zealand Timber Journal*, Wellington; 19. *Newsletter of the New Zealand Forest Service*, Wellington; 20. *Orman ve Av*, Ankara; 21. *Report of the Forest Department of Western Australia*, Perth; 22. *Revista Forestal Argentina*, Buenos Aires; 23. *Science Afrique*, London; 24. *Southern Lumberman*, Nashville, Tenn.; 25. *Soviet Weekly*, London; 26. *Timber Trades Journal*, London; 27. *Times*, London; 28. *Unasylva*, Rome; 29. *Unesco Bulletin*, New Delhi; 30. *Veneers & Plywood*, Indianapolis, Ind.; 31. *Wood Preserving News*, Chicago.

International Conferences

1960	**F.A.O.**	
Sept.	1st FAO Conference on Plant Protection in the Near East.	Baghdad
17–30 Oct.	ECAFE/FAO Conference on Pulp & Paper Development in Asia and the Far East.	Tokyo
1 Aug.–31 Oct.	Forest Inventory Training Centre for the Far East.	Malaya
Sept.	Seminar on Forest & Forest Products Statistics.	Central America
1960	**Other**	
15–24 June	7th General Assembly of the International Union for the Conservation of Nature.	Warsaw & Cracow
15–23 July	6th Commonwealth Mycological Conference.	London
24 Aug.–29 Sept.	C.A.B. Review Conference.	London
1961		
21 Aug.–6 Sept.	10th Pacific Science Congress.	Honolulu

FAO. The volume of roundwood harvested from the world's forests reached a new record in 1958 (1664 million cu.m.), according to figures just released by FAO. The leading country in sawn-wood production was the U.S.S.R. with 87 million cu.m., followed by the U.S.A. with 79 million. A new record was reached in plywood production, with N. America accounting for 59% of the world's output. Output of particle board continues to grow, with Europe producing 60% and N. America 25% of world output (**4**; 21.12.59).

It is proposed to organize a "World Seed Year," probably in 1961, during which all member governments would initiate or intensify programmes for the production and distribution of high-quality seeds through a suitable national authority. It is hoped that foresters, horticulturists, and farmers will participate actively in national seed campaign committees, which will be formed to promote seed production, certification, and distribution, as well as other activities connected with tree improvement (**28**; Aug. 1959).

Antarctic. Timber used for general structural work in the Australian National Antarctic Research Expedition Base at Mawson underwent some unusual changes. It was put together in the normal way with nail jointing, but after about 6 months (mean r.h. ca. 5%, temperatures −35 to 0° F.) the withdrawal resistance of the nails had been so reduced that in some cases 2-in. nails could be removed by hand. A piece of 4 × 2 in. scantling, which showed no sign of brittleness when fresh, could be snapped like a carrot after exposure to the extremely cold conditions (**7**; Nov. 1959).

Argentina. The Instituto de Investigaciones Forestales, set up in 1957 by the Ministry of Agriculture of El Chaco, has now begun work. Its programme at present is directed solely towards the study of properties and uses of native timbers.

The Instituto Agrotécnico Económico de Misiones (IATEM) has now set up at Posadas a Forest Research Department with a comprehensive programme of research on the natural and artificial forests of Misiones, including silviculture, management, methods of afforestation, and wood technology of native and introduced trees (**22**; Oct./Dec. 1959).

Australia. Observations on flowering and seed formation of Karri (*Eucalyptus diversicolor*) in

W. Australia are now sufficient to enable the cycle over most of the Karri region to be forecast. Apart from the value of this information in planning the burning of regeneration areas, it will enable apiarists to forecast the honey flow with a greater degree of accuracy (**21**; 1959).

Canada. The Government has given notice of the impending establishment of a Federal Ministry of Forests. At present, natural resources and forests are the provinces' responsibility, but the Northern Affairs Department looks after experimental work, and the Agricultural Department looks after forest biology. The Federal Government also has charge of forestry in Yukon and the Northwest Territories. Now the Government wants to put the whole problem under one roof. The wood industries account for 29–36% of Canadian exports (**27**; 15.1.60).

A solution to the problem of keeping veneer logs covered with hot water to prevent cracking and checking after conditioning by hot-water cooking was found by the installation, at a Canadian mill, of spray heads along the outside edge of the vats. Being directed towards the centre, the sprays continuously cover all exposed log surfaces with hot water taken directly from the vats themselves (**30**; Feb. 1960).

Sawdust beds have proved useful for treating and preventing bedsores in paralysed and aged patients. The sawdust is spread in the sun and sifted before use. It is then put on to an improvised stretcher and the patient laid directly on the sawdust. A wound should be washed several times daily with soap and water, but owing to the absorbent properties of the sawdust the mattress remains dry. The sawdust should be completely renewed after ten days (**19**; Oct. 1959).

France. A new forestry school [École Technique Professionelle Agricole et Forestière du Massif-Central, Meymac (Corrèze)] was opened on 25 Oct. 1959. The Council of the school is presided over by an Inspecteur Générale des Eaux et Forêts, and includes representatives of various national associations of forest owners, timber merchants, sawmillers, wood industries etc. It is planned to take 100 resident students, entering at 16–20 years of age by competitive examination, and is designed to provide a training for forest owners, estate agents, forest nurserymen, afforestation contractors, logging contractors etc. The 2-year course will cover silviculture, afforestation techniques, logging techniques, transport etc. A winter agricultural school is attached to the establishment (**16**; 1959).

There are 380,000 trees in Paris—enough to cover a fifth of the city area if planted at 30-ft. intervals—but they are dying off at a rate of more than 3000 a year. Part of the trouble arises because so many different authorities are responsible for the care of the trees: the highways service looks after the shady Planes that line the boulevards, the Senate tends the trees of the Luxembourg Gardens, the navigation authorities keep an eye on the Poplars along the Seine, and the Administration des Eaux et Forêts is responsible for the Bois de Boulogne. It is intended gradually to replace all the trees planted a century ago, in the great days of Baron Haussmann and his boulevards, without too drastically spoiling the familiar verdant look of such streets as the Champs Elysées. But there are only 132 woodsmen to carry out this immense task. Unfortunately the tree-lined French main roads, however pleasant to drive along, are the cause of many accidents. In 1957, for instance, about one-twelfth of all fatal road accidents involved vehicles hitting trees. The Minister of Transport has announced that all trees in dangerous positions by the roadside are to be felled. Up to last year, 20,000 trees had already been felled for this reason (**27**; 9.3.60).

Germany. An Oak with a d.b.h. of 135 cm. and a volume of nearly 18 cu.m. was recently found at the bottom of a gravel pit at a depth of 20 m. The stem, whose growth age was 900 years, had probably been preserved in bog or groundwater for 7000 years. Its wood was completely sound and soft and yielded excellent veneer. Traces of charcoal at the butt-end suggest that it may have been felled by burning the roots (**10**; 23.1.60).

German scientists have observed that locusts respond to certain ultrasonic frequencies by moving towards the transmitter. It is planned to use this response to divert locusts to waste lands or to poisoned fields (**23**; 1959).

A paper mill in Düsseldorf is producing "paper" made from non-cellulosic synthetic fibres by methods resembling traditional paper-making processes. The paper is said to have greater dry and wet strength, resistance to light, chemicals, and dirt, dimensional stability etc., than conventional paper but is too expensive for large-scale uses such as newsprint or ordinary wrapping paper. It is, however, considered suitable for special uses in packaging, banknotes, towels, or hospital sheets (**9**; 3.3.60).

Ghana. Various chlorinated hydrocarbon insecticides have been tested in large-scale field trials in recent years against the Cacao capsids *Sahlbergella singularis* and *Distantiella theobroma*, and their great success has led to the widespread use of γ-BHC in routine control. One of the most persistent of these insecticides, dieldrin, has been used experimentally with excellent results for controlling the mealybug *Pseudococcus njalensis*, the principal vector of Cacao swollen-shoot disease, by decreasing the populations of its attendant ants. The use of these chemicals, however, has been accompanied by spectacular increases in other noxious insects not normally important as pests. Little is known of the mechanism of these increases: presumably natural enemies are destroyed. The new pests are borers or miners, presumably less exposed to the effects of spraying than their parasites (**17**; 26.12.59).

Great Britain. The Dartmoor Preservation Association says that unless protective measures are taken immediately, there is a serious danger that few of the Oak-dominated woods of Dartmoor will be left in 10 years' time. It is trying to enlist the help of the National Parks Commission, the Nature Conservancy and the Council for the Preservation of Rural England. The latest threat is to Blatchford Woods near Plymouth. They were sold recently, and the new owners propose to deep-plough 360 acres and plant 'cash-crop' conifers. The increasing activities of forestry syndicates are regarded by the Association as the major threat to indigenous woodlands. The syndicates are formed to buy woods for felling and re-planting with conifers (**3**; 8.2.1960).

The Council for Scientific and Industrial Research of the D.S.I.R. announce that they have reviewed the operation of the arrangements they made early in 1958 [see *F.A.* 19 p. 631], under which they asked the Timber Development Association to assume responsibility for certain aspects of timber research previously discharged by the Forest Products Research Laboratory at Princes Risborough. The steering committee for the Laboratory have become convinced that the new arrangement did not allow sufficient latitude to the Laboratory in the discharge of its essential duties, and that the division of functions between the Laboratory and any other research organization must be more flexible. At the same time they feel that it is essential to maintain an adequate and well balanced research team at the F.P.R.L. Simultaneously with the release of this statement, the D.S.I.R. announced the appointment of Mr. Henry Wooldridge to succeed Dr. F. Y. Henderson, who retires next October, as Director of the F.P.R.L. at Princes Risborough (**26**; 26.12.59).

Collins Music Hall, Islington, opened by Sam Collins the Irish singer in 1863, and closed last year, is to become a timber store, having been bought by timber importers whose yard adjoins the hall (**3**; 9.2.1960).

India. The President has given his assent to the West Bengal Wild Life Preservation Bill. The present legislation replaces an Act for the protection of birds and animals that had proved ineffective. In addition to imposing deterrent penalties for crimes against wild life, the enactment provides for the appointment of officers and honorary game wardens to implement its provisions (**11**; 2.1.60).

Korea. On 11 Nov. 1959, some 5000 Korean technicians in soil conservation, forestry management and upper watershed development opened a 3-day discussion and training conference at Pilot Project No. 3, near Seoul. As part of the opening ceremonies for this second National Conservation Conference of Korea, the Korean Chapter of the Soil Conservation Society of America presented to President Syngman Rhee an engraved certificate and a Hugh Hammond Bennett SCSA medallion enrolling him as an honorary member of the chapter. The Pilot Project No. 3 is one of 38 such areas where grassland-legume cover has already been established on previously bare hillsides, and seedling Pine and Acacias (intended for fuelwood) have made good growth. President Rhee, in opening the conference, spoke for almost an hour on the need for improved conservation programmes in Korea. He reviewed the former bad condition of most of Korea's upper catchment areas, and praised the conservation work that has been done to date (**15**; Jan. 1960).

Libya. Since 1952, an estimated 12,984 ha. of state forest have been established in Tripolitania, including 4695 ha. on stabilized sand dunes. There are still at least 250,000 ha. of sand dunes in the maritime zone alone, which ought to be stabilized as soon as possible. The most successful species planted are *Eucalyptus rostrata*, *E. gomphocephala*, and *Acacia cyanophylla*. Spacing has been at 4 × 4 m., and ploughing for site preparation has been found to reduce planting and weeding costs and to increase increment by 50% (**5**; 1.5.59).

New Zealand. The N.Z. Forest Service began the largest controlled burn ever attempted in New Zealand, when it burnt 70 acres of logging slash in Kaingaroa Forest on 14 Oct. 1959. For purposes of fire protection, the forest is to be divided up by fire-breaks half-a-mile wide. The first of these is 3 miles long (later to be extended to 6 miles) and is to be used for agricultural crops. For the first 70-acre burn, 50 men were employed, with 700 men ready to help should the fire get out of hand (**19**; Oct. 1959).

The hull of a Fairmile whale-chaser, operated by an Australian company from Great Barrier Island, Hauraki Gulf, was sheathed with "tanalized" Pine to protect it from friction caused by whales. After three years in the water, the timber was found to be 100% sound and is to remain on the hull for further service after repainting (**18**; Oct. 1959).

Pakistan. Research is in progress at Karachi on the alkaloids of *Rauwolfia serpentina*. It is hoped that one substance (serpajmaline), which has been isolated, may be used in the treatment of high blood pressure without the bad side-effects consequent on the use of the whole plant. *R. serpentina* is known in India as the snakeroot, because it has long been used in the treatment of snake and scorpion bites. In Bihar it is used by villagers to quiet sick children, and is known as 'madman's medicine' (**29**; Nov. 1959).

Poland. Two new National Parks were established in 1959. The Kampinos National Park (55,000 acres) includes part of the primeval forest. The vegetation types include Pine on the sand dunes, and mixed hardwoods on shifting sands, wet meadows, and peat bogs. The Karkonosze National Park covers 13,500 acres in the Sudeten mountains, with mixed evergreen/deciduous forests at the lower levels and *Pinus mugo* at the timberline (**13**; Oct. 1959).

Turkey. A well-wooded recreation park, to be called the Fatih Forest, is being established near Istanbul. To date, about a third of the total area of 565 ha. has been planted, on contour strips, chiefly with *Pinus brutia*, *P. pinaster*, *P. sylvestris*, and *Cupressus sempervirens*, at a cost exceeding £6,200 (**20**; May 1959).

U.S.A. In order to gain a further understanding of the biology and ecology of the 'town' or leaf-cutter ant, *Atta texana*, whose colonies are often measured in acres, and which has been known to wipe out 100 acres of newly planted Pine, the Southern Forest Experiment Station has co-operated with the Continental Can Co. in excavating a well established colony and mapping its nest. The colony chosen was only ca. 4 years old, but had already killed or seriously damaged several hundred Loblolly Pine seedlings that had been planted 5 years before. Two bulldozers were used to slice away layers of earth from the 'town', their sharp blades laying open the various kinds of ant excavations without crushing or filling them. Early cuts exposed galleries far out on the edges of the active area, running inwards towards the centre. The galleries were connected with fungus gardens, nest cavities, and areas used for disposal of debris. At lower levels, chambers carved out of the sandy soil were larger, nearer the centre, and mostly empty. These were the caverns that would be used for fungus cultivation in the winter. Many were 1–2 ft. in diameter. By the end of the 2nd day the bulldozers had reached a depth of 15 ft. A few galleries led at least 20 ft. further down, but these were probably for the purpose of drainage or to reach water in dry weather (**8**; Oct./Dec. 1959).

A grant of $300,000 has been made to the Yale University School of Forestry to establish a Chair of Industrial Forestry, the first of its kind in the country (**2**; July-Aug. 1959).

In 1958, Congress enacted legislation permitting the U.S. Forest Service to embark on a long-planned programme for the development of forest fire research laboratories. The physical plant for the first of these, the Southern Forest Fire Laboratory, was completed in the autumn of 1959. Built by the State of Georgia at Macon, Ga., the laboratory will be equipped and operated by the Southeastern Forest Experiment Station. A second, the $900,000 Northern Forest Fire Laboratory, to be operated by the Intermountain Station, is scheduled for completion in June 1960. It will stand near the Aerial Fire Depot and Smokejump Center at the headquarters of the U.S. Forest Service Region One at Missoula, Mont. A third laboratory is planned for California (**14**; Jan. 1960).

Emotions have been roused by a proposal to dedicate a 23-mile strip of the Oregon dunes, totalling 33,070 acres, as a national seashore area. Magnificent and unique, the strip includes lakes with a variety of fish and visiting wildfowl, 14,000 acres of sand, 13,728 acres of chiefly non-productive forest land, and, at the Sea Lion Caves, the only known mainland colony of Stellar's sea lion. Opposition to the Oregon Dunes and Sea Lion Caves National Seashore Area appears to come from the present private owners of part of the land, and from speculators interested in the water stored beneath the dunes, though the local press and some communities would welcome the influx of millions of tourist dollars (**1**; Jan. 1960).

A postage stamp commemorating the Fifth World Forestry Congress—held for the first time in the Western Hemisphere—will be issued on 29 Aug. 1960, the opening day of the Congress in Seattle, Wash. The Post Office Department has issued in recent years 4 wildlife conservation stamps, featuring the pronghorn antelope, the wild turkey, the whooping crane, and the king salmon, as well as stamps honouring forest and soil conservation. This series will be continued in 1960 by the issue on 18 April of a water-conservation stamp on the occasion of the Seventh National Watershed Congress in Washington, D.C. (**14**; Jan. 1960).

A record (190,000-bushel) harvest of seed cones this autumn was reported by the Weyerhaeuser Company. The cones should yield about 100,000 lb. of seed. Hundreds of week-end cone collectors were paid a total of $427,500 by Weyerhaeuser for their efforts (**14**; Dec. 1959).

Lumberjacks in Oregon recently got the surprise of their lives when they felled an old Cedar that burst into flames as it fell to the ground. It was discovered that the tree was little more than a hollow shell and that a spark from a near-by fire in the previous year had apparently started a fire that had smouldered inside it for 5 months, burning out more than 60 ft. of the stem without producing enough smoke to be noticed (**19**; Oct. 1959).

Portions of the *New York Times* and two other papers have recently been produced on newsprint made entirely from southern hardwoods. The paper is said to compare well with ordinary newsprint in strength, brightness, and smoothness, and to have given satisfactory results in test runs at speeds reaching 46,000 copies/hour (**24**; 1.1.1960).

S.A. Woods Machine, Boston, has produced a flaker-surfacer which produces flakes instead of planer shavings or sawdust when processing rough lumber. Saleable flakes for pulping or particle-board manufacture, can be obtained at speeds up to 1000 linear ft./min. (**6**; Dec. 1959).

In 1955 a timber pier (preservative-treated Douglas Fir) was built in San Francisco to a design that eliminated all horizontal transverse bracing within the wetted area, observations of the method of attack of marine borers (mainly *Limnoria* sp.) in the previous structure having clearly indicated the easy entry afforded the borers by bolt holes and the exposed ends of bracing. In the new design, lateral stability is provided by batter piles framed into the pier at deck level, and though no claim is made for complete borer control, a much longer service life is made possible by effectively eliminating points of entry within the most susceptible zone (**31**; Oct. 1959).

U.S.S.R. Tests have been made in the Krasnodar region on various methods of helicopter logging: single trees with crowns, tree-length logs, and bundles of logs. In many cases a steel cable was attached to the tree before felling, so that the helicopter could whisk the tree up and away before it could fall to the ground. Carrying loads of 8–10 tons, helicopter efficiency was greatest over distances of 1 to 14 miles (**25**; 1.1.60).

A floating machine, constructed for use in connexion with Siberian water-power works, is also being used for logging in the Ukraine. The tree-felling unit is equipped with an under-water saw, can cut trees at a depth of 0·5–6 m. under water, and can clear a strip 20 m. wide through flooded forest in a single run. The wood is brought on deck for further conversion, and the waste wood is burnt in the power unit (**12**; 4.2.60).

The oil from one Baku oilfield contains a considerable quantity of sulphur, which made necessary renewal every 2–3 months of the metal pipes through which it flowed. Plywood pipes were then installed, with excellent results, and have now been adopted on a number of other oilfields round Baku. In Lvov, the waterworks is using plywood pipes, following a long observation period by sanitary engineers. Pipes of this type, made in Leningrad and the Urals, with diameters of 50–300 mm., resist considerable interior pressure (**25**; 18.2.60).

Viet-Nam. The first National Park was inaugurated in 1959 at Trang-Bom, some 30 miles from Saigon. It covers 780 acres of representative plains forests (**13**; Oct. 1959).

FORESTRY COMMISSION PUBLICATIONS

Describe the progress of forestry in Great Britain and the present results of research work. Publication List No. 31, also booklets "Grants for Woodland Owners," "Forestry in England" and "Forestry in Scotland" are available free and post free from the Secretary, Forestry Commission, 25 Savile Row, London, W.1.

Recent issues include:

Reports:		
Small Pulp Mill Survey: Economic Study	4*s.* 0*d.*	(4*s.* 5*d.*)
Board Mill Survey: Economic Study	5*s.* 0*d.*	(5*s.* 6*d.*)
Report on Forest Research for the Year ended March 1958 (including original papers)	9*s.* 6*d.*	(10*s.* 1*d.*)
Bulletins:		
No. 14. Forestry Practice. Fully revised 1958	5*s.* 6*d.*	(6*s.* 0*d.*)
No. 31. Code of Sample Plot Procedure	15*s.* 0*d.*	(15*s.* 7*d*).
Forest Records:		
No. 38. Design of Poplar Experiments	1*s.* 9*d.*	(1*s.* 11*d.*)
No. 39. The Collection of Cones from Standing Trees	3*s.* 6*d.*	(3*s.* 10*d.*)
Leaflets:		
No. 12. Income Tax and Death Duties on Woodlands (Revised 1959)	1*s.* 3*d.*	(1*s.* 5*d.*)
No. 19. Elm Disease. Ceratostomella ulmi (Revised 1958)	9*d.*	(11*d.*)
No. 32. Pine Looper Moth. Bupalus piniarius (Revised 1959)	1*s.* 3*d.*	(1*s.* 5*d.*)

(Inland post free prices are given in brackets)

Obtainable from H. M. Stationery Office, York House, Kingsway, London, W.C.2; by post from H.M.S.O., Box 569, London, S.E.1; or through booksellers. Overseas agents include: British Information Services, 45, Rockefeller Plaza, New York 20; Eastern House, Mansingh Road, New Delhi; and El Markas Building, Bunder Road, Karachi 2. United Kingdom Information Office, 275, Albert Street, Ottawa, Angus Robertson, 89, Castlereagh Street, Sydney, N.S.W. Whitcombe and Tombs, Ltd., Auckland, N.Z. Central News Agency, 112, Long Street, Capetown.

"FORESTRY"

JOURNAL OF THE SOCIETY OF FORESTERS OF GREAT BRITAIN

Presents the results of practice and research in both the growing of timber and its utilization. Its field covers the basic sciences of silviculture, forest physiology and ecology, forest soils, wood structure, and timber physics, and allied sciences such as forest entomology and forest mycology.

Twice yearly. Subscription price: 40s. per year. Single issues: 25s. each.

Published by the Oxford University Press and obtainable through the usual trade channels, or by direct subscription to the Society's Secretary at 7, Albyn Place, Edinburgh 2. *Free to members.*

The Society of Foresters of Great Britain was founded in 1925, to advance and spread in Great Britain the knowledge of technical forestry in all its aspects. Subjects of the British Crown who hold degrees or diplomas in forestry, etc., are invited to join as Professional Associates, paying £1 1s. per annum for the first five years, and £2 2s. per annum thereafter. Fellows, elected from among Professional Associates of at least five years standing, subscribe £2 2s. yearly. Other persons (or corporate bodies) may join as Ordinary Members, subscribing £2 2s. a year. Professional Members, who are British subjects without degrees, engaged whole time in Forestry, pay £1 1s. per annum. Forms of application for membership, giving further details, may be obtained from the Secretary.

REVUE FORESTIÈRE
FRANÇAISE

La Revue Forestière Française, published by the École Nationale des Eaux et Forêts, is of interest to all who wish to be kept informed of research undertaken or progress achieved in everything concerning forestry:

—applied natural sciences: botany, zoology, pedology

—forestry proper: silviculture, management, valuation, technology, etc.

Ten to twelve numbers of about 80 pages each are issued annually.

Yearly subscription Fr. 1,500 in France, Fr. 2,000 abroad. Payment to postal cheque account: Nancy 5403-06 in the name of M. l'Agent-Comptable de l'École Nationale des Eaux et Forêts à Nancy (France). A sample copy will be sent, free, on application to: Revue Forestière Française, 14, rue Girardet, Nancy.

THE EMPIRE FORESTRY ASSOCIATION

At/THE ROYAL COMMONWEALTH SOCIETY, NORTHUMBERLAND AVENUE, LONDON, W.C.2

OBJECTS OF THE ASSOCIATION

1. To foster public interest in forestry.
2. To secure general recognition of the dependence of timber supply upon forest management.
3. To collect and circulate information relating to forestry and the commercial utilization of forest products.
4. To form a centre for all engaged in forestry.
5. To provide a means of communication between all concerned.

EMPIRE FORESTRY REVIEW

The official organ of the Association is published quarterly. Price from January, 1952, 7/6 per number. (Free to Members.)

EMPIRE FORESTRY HANDBOOK

A new edition was published in 1957. It includes, besides the list of members, details of the Forest Officers and Forest Research and Higher Education Institutions of the Empire with other Departments and Institutions connected with Empire Forestry; List of the Forest Research Organizations of the World; Forestry Societies of the Empire; leading Forestry Periodicals of the World; and Useful Figures for Foresters. A separate section gives the Forest Resources of the World and the British Standard Nomenclature of Timbers in botanical order, with weights. Price 20 shillings. (*Free to all Members of the Association.*) Orders should be sent to the Editor-Secretary, address as above.

TERMS OF MEMBERSHIP

Membership is divided into two Classes: Individual and Affiliated Members.

INDIVIDUAL MEMBERS:
- (*a*) Life Members, £20.
- (*b*) Full Members, £2 annually.
  - *Note:* Professional Members are allowed a reduction depending on income or salary.
- (*c*) Associate Members, £1 annually.

AFFILIATED MEMBERS: £5 annually.

All, with the exception of Associate Members, have the full privileges of membership, including the power of voting at General Meetings of the Association, access to the Association's premises and library and the right to receive all publications issued by the Association.

Associate Members receive the EMPIRE FORESTRY REVIEW and HANDBOOK, but have no other rights.

For further particulars apply to: W. MACF. ROBERTSON, *Editor-Secretary.*

THE SOUTH AFRICAN FORESTRY ASSOCIATION

P.O. Box 1022 **Pretoria**

Objects: To create a forum for the open discussion of all topics relevant to the science and practice of Forestry and allied subjects; to collect and disseminate information and statistics regarding silviculture, forest management, wood utilization and marketing, tree planting, forest conservation (including fauna, flora, land and water), and the recreational uses of forest resources in South Africa.

Membership: Is open, at the discretion of the Executive Committee, to all persons, firms, and other bodies interested in furthering the above-mentioned objects and comprises:—

(1) *Life Members*, having full privileges and voting rights and subscribing not less than £15 15s. 0d.
(2) *Full Members*, having full privileges and voting rights and subscribing £1 1s. 0d. per annum.
(3) *Associate Members*, having full privileges but no voting rights and subscribing 10s. per annum.
(4) *Affiliated Members*, consisting of registered or incorporated companies, societies, corporations or commercial firms represented by a nominee with full privileges and voting rights and subscribing £1 1s. 0d. per annum.

Publications: The official journal of the Association is published twice yearly at a price of 7s. 6d. per issue (free to all members of the Association) and the Association also sponsors the publication of contributions of educational or instructive value as separate issues from time to time.

For further particulars apply to:

The Hon. Secretary-Treasurer,
P.O. Box 1022,
PRETORIA,
SOUTH AFRICA.

RECENT LITERATURE ON FORESTRY

Forstliche Umschau

An abstract journal covering the fields of forestry and forest products. Editorial Board: K. Abetz, Freiburg; H. Gläser, Hann.-Münden; A. Horky, Vienna; H. Leibundgut, Zurich; K. Mantel, Freiburg; A. Richter, Eberswalde; K. Rubner, Munich; J. Weck, Reinbek; E. Zieger, Tharandt. Editors: J. Weck and C. Wiebecke, Reinbek, in collaboration with K. Abetz, Freiburg.

Published quarterly, each number contains 96 pages, 4 numbers, plus a detailed index, forming a volume. Subscription per volume: *DM* 84 [ca. £7] plus postage.

Rohmeder-Schönbach
Genetik und Züchtung der Waldbäume
[Genetics and Breeding of Forest Trees]

1959. Pp. 336. 163 figures. Full cloth binding: *DM* 38.

Benno Herting
Biologie der westpaläarktischen Raupenfliegen
Dipt., Tachinidae

Monographien zur angewandten Entomologie Nr. 16 1960. Pp. 188. 12 figures. Board *DM* 32. For subscribers to Zeitschr. f. angew. Entomologie, *DM* 28.

Forstwissenschaftliches Centralblatt

(Central Journal of Forestry Science, and organ for the publications of the Forestry Research Institute, Munich).

Founded 1879 by Franz von Baur. Editorial Board: K. Abetz, Freiburg; E. Assmann, V. Dieterich, L. Fabricius, R. Geiger, B. Huber, J. N. Köstler, G. Krauss, W. Laatsch, E. Rohmeder, J. Speer, K. Vanselow, W. Zwölfer, Munich; H. Burger, Zurich; A. Heger, H. Jahnel, Tharandt; L. Tschermak, Vienna; W. Wittich, Göttingen. Editor: H. v. Pechmann, Munich. Published bi-monthly, with 64 pages. Subscription *DM* 24 for 6 months, plus postage.

Joachim Krahl-Urban
Die Eichen [The Oaks]

A forestry monograph on the Pedunculate and Sessile Oaks. 1959. Pp. 288. 110 figures. Full cloth binding *DM* 48.

Zycha-Röhrig-Rettelbach-Knigge
Die Pappel [The Poplar]

Its planting, tending, and utilization. A guide to practice. 1959. Pp. 121. 57 figures. Full cloth binding *DM* 14.

VERLAG PAUL PAREY · HAMBURG AND BERLIN

Spitalerstrasse 12, Hamburg 1 **Lindenstrasse 44/47, Berlin, SW 68**

OXFORD SYSTEM OF DECIMAL CLASSIFICATION FOR FORESTRY

Amendment No. 3, as authorized by the Joint FAO/IUFRO Committee on Bibliography (Madrid, September, 1959).

At 0, *p.* 12, *in square-bracketed comment under main title add*
; for *general* monographs of individual species or other taxonomic groups see comment at 17

At 14 *in square-bracketed comment add*
See also comment at 17

At 17 *in square-bracketed comment, add a third and fourth paragraph as follows*

The numbers that follow, with their further subdivisions (alphabetical or numerical) can serve, by using cross-references, as an index to *any other* information on the plants concerned, as well as pure taxonomy. The procedure is explained by examples in section (3) of the Introduction. Two further examples:

(*a*) General monographs on individual taxonomic units (chiefly species) may be referenced as 0 : 17 . . ., or 0 - -17 . . ., or 17 . . . - - 0;

(*b*) their general silviculture is treated similarly as 2 : 17 . . ., or 2 - - 17 . . ., or 17 . . . - - 2. If only one card can be allowed, the third method has the advantage of collecting all the information on e.g. a species in a single place in the catalogue—viz. at 17 . . . - -.

If desired, the same procedure may be used for animals, under 14.

At 233 *in square-bracketed comment read*
[Cross-reference, as appropriate, to subdivisions of 114.4, 116, or 187. For afforestation policy see 913/914]

At 322.3 *add* , 'chemical barking'

At 411 *add subdivisions as follows*

411.1	Natural enemies concerned in control
411.11	Lower invertebrates
411.12	Insects and other arthropods
411.13	Amphibia and reptiles
411.14	Birds
411.15	Mammals
411.16	Bacteria and fungi
411.18	Virus diseases
411.19	Miscellaneous

At 62 *insert after* WORKING PLANS *in round brackets*
(SHORT- AND LONG-TERM).

At 811.7 *insert after* bark *in round brackets*
(including also gross morphology)

At 928 *read*
Fragmentation and consolidation of holdings.